ELECTRICAL REVIEW

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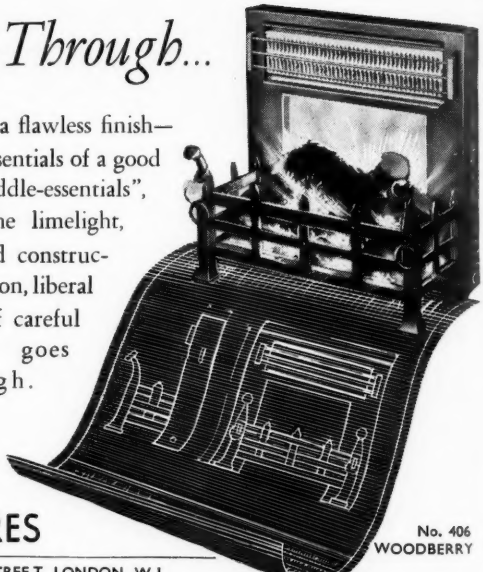

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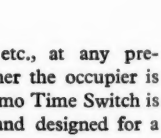

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ELECTRICAL REVIEW

Vol. CXLVI No. 3764 13TH JANUARY, 1950

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Factory Accidents

CHANGE OF THE FIVE-YEAR ELECTRICAL DOWNWARD TREND

THE annual report of the Chief Inspector of Factories for 1948, which was briefly summarized last week, begins by emphasizing that the passage of the Factories Act of that year has very materially enlarged the scope of the new code of regulations. Consequently many thousands of employers engaged in engineering construction, building and decorating became, for the first time, subject to statutory provisions (including electrical) relating to the safety, health and welfare of their workpeople.

More Hazards

Not only is the burden of the factory inspectors growing in this way, but industrial hazards with which they have had to contend are multiplying, too; for example, the gradually increasing power and scope of X-ray apparatus used for examining castings and all sorts of fabricated articles; the employment of radioactive materials as air ionizers to disperse static charges which accumulate on printing and textile machinery; and the manufacture of cathode-ray tubes for television projection in public cinemas of a power that emit X-rays in quantities which could be dangerous if uncontrolled.

The report for 1947 referred to the increasing number of mechanical aids that were then being installed to save manpower and generally to speed up output. The 1948 report mentions that the development of automatic controls for effecting a series of operations by individual machines was proceeding apace, but no outstanding instances of the use of electronic devices to secure the safety of machine operators had been recorded. It seems also to the inspectors prudent, for the present, to suggest that photoelectric devices should not be encouraged when proven and reliable methods of fencing are known to be practicable.

There has been the usual crop of clothes and hair entanglements with moving machinery and attention is drawn to the desirability of guarding all fans more effectively, whether they are normally within reach or not, including those in "unit" heaters, while portable blowers also need careful watching.

Higher Electrical Rate

The totals of notifiable accidents and fatalities were both slightly less than in the previous year, whereas those classed as electrical (which are separately reported upon in more detail by the Chief Electrical Inspector of Factories) increased for the first time in five years. This change of the downward trend which had been consistently maintained since the peak year of 1943 may presumably be ascribed to the greatly increased use of electricity in the "production drive" and for stepping up national output. The preponderance of accidents in

certain categories, so far as apparatus is concerned, remained very much the same as in previous years. After eye injuries associated with welding, the worst offender was switchgear below 650 V, followed by fixed cable installations, portable electrical machines and fuse-gear.

It is pleasing to end on the note of approval with which the report mentions the improvements taking place in the lighting of factories. Some of the most striking results have been achieved in textile mills in the Scottish border country. It is, however, by no means well enough understood that suspension by chains, or wires and hooks, does not afford to the fittings of fluorescent tubes and ordinary pendant lamps the degree of continuity for earthing which is required under the Factory Regulations.

VACATIONAL TUITION

The vacational work scheme for college students wishing to acquire industrial experience, with associated facilities for the interchange of students between this and Continental countries in summer, both organized from the Imperial College at South Kensington, has become widespread. Not only is this service acceptable to students, but it is also being increasingly utilized by industrial and research "executives" as an aid to the selection of staff from among students before they have completed their studies. Students who make use of these facilities are, at the same time, provided with opportunities of more decisively formulating plans for their future after seeing for themselves at close quarters how industrial concerns function.

INTERFERENCE SUPPRESSION

Car radio is too large a subject to be touched upon in a paper like that on automobile electrical equipment which was presented at the Institution of Mechanical Engineers last week. Its author did, however, express the opinion that the suppression of radio interference was not work for the amateur, novice, or even the skilled radio mechanic. It can best be tackled by the manufacturers concerned (of car, radio and car electrical equipment) when the vehicle is designed. Only at that stage can re-routeing of cables, additional bonding of body and chassis and a second resistor, if necessary, be properly provided for. About half the motor cars at present made can be made to comply with the Wireless Telegraphy Act requirements by fitting a resistor at the distributor. If a second should be needed, it should logically be associated with the spark plugs. This, the author of the paper points out, would not only "tidy up" the ignition system, but also improve plug-point life and even increase fuel economy by enabling "leaner" mixtures to be burned with wider plug gaps.

TAX ON WATER HEATERS

The Treasury Order reducing the purchase tax on electric thermal storage water heaters has been made at last, over six weeks after the original announcement of the Government's intention. As the differentiation between gas and electric storage heaters is now considered unjustifiable, the further step should be taken of bringing the tax on other types of electric water heaters to the same level. A better idea would be to remove the tax altogether, because water heaters are as essential as cookers, which were relieved of purchase tax long ago. Moreover, contrary to the belief of the Ministry of Fuel and Power, they are not peak-load appliances; their diversity is probably as great as that of cookers.

UNWANTED FIRES

Industrialists who spread their demands, at great inconvenience, to reduce the load on the national electricity supply system quite justifiably ask why Electricity Boards continue to sell the electric fires which are superimposed upon the industrial peak. The Boards realize the illogicality of their position but have hesitated to impose a definite ban upon electric fire sales. Now, however, the Eastern Board has decided that restrictions must be imposed and generally its action has secured sympathy. A certain section of the Press, of course, has treated it as bureaucratic interference with the liberty of the individual—which is absurd. It is very regrettable that such a convenient and efficient appliance as the electric fire should have to be regarded as a menace but such are to-day's conditions.

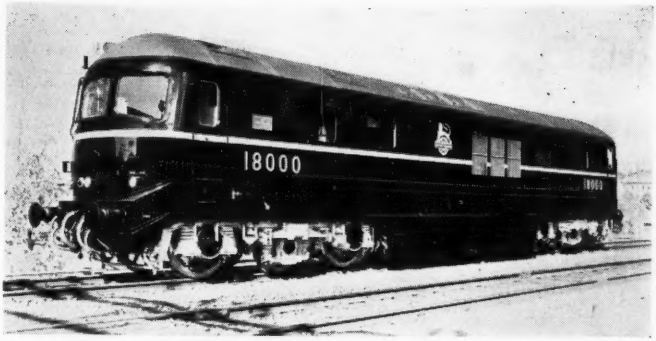


Fig. 1.-Gas turbo-electric locomotive built at the Brown-Boveri works in Switzerland for the Western Region of British Railways

Gas-Turbine Electric Locomotive

FIRST OF TWO ORDERED FOR BRITISH RAILWAYS

IT may be recalled that in 1946 the former Great Western Railway decided to build two gas-turbine operated electric locomotives to the specification of Mr. F. W. Hawksworth, chief mechanical engineer, for main-line passenger service. They were intended for the London to Plymouth, Bristol, Fishguard and Birkenhead services, for which trains of up to eighteen coaches weighing 650 tons would be required to reach a maximum speed of 90 m.p.h. One was ordered from British Brown-Boveri, Ltd., and the other from the Metropolitan-Vickers Electrical Co., Ltd. Built in Switzerland, the Brown-Boveri locomotive (Fig. 1) is now completed and has recently been running trials in that country.

The open-cycle turbine power unit is of the same general design as an earlier locomotive built for the Swiss Federal Railways, first operated before the war, but it develops 2,500 h.p. instead of 2,200 h.p. at the coupling shaft. Views of the plant and the internal arrangement of the British unit are not yet available, but the section (Fig. 2) and the test-bed view (Fig. 3) of the Swiss unit are closely comparable.

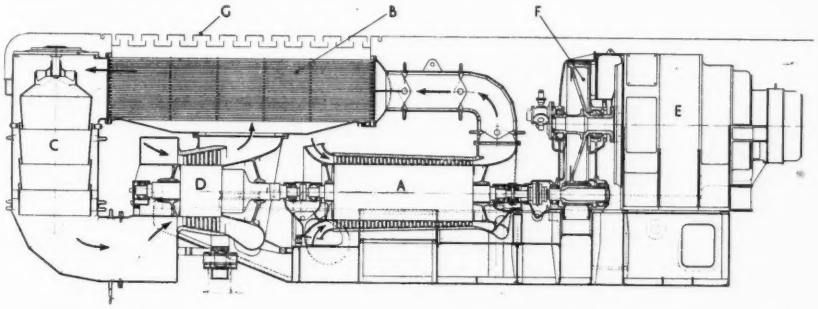


Fig. 2.—Sectional view of locomotive components of the pre-war Swiss Federal Railways locomotive. The locomotive described is similarly arranged but develops 2,500 h.p. instead of 2,200 h.p.

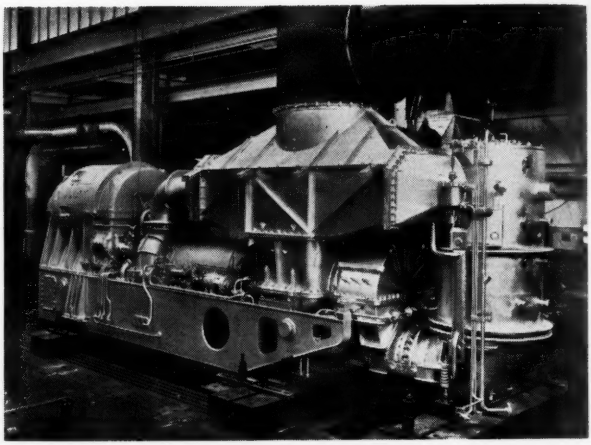


Fig. 3.—Test-bed view of complete turbo-generator set capable of being lifted on to and off the locomotive chassis

Air drawn through the sides of the locomotive is compressed in a multi-stage axial-flow compressor, A, to a ratio of over 4:1 and delivered through a recuperator, B, to the single combustion chamber, C, at a temperature of about 500 deg F. Here the fuel—probably "Pool" diesel oil in this country—is injected and burnt. The combustion gases at about 1,100 deg F drive the multi-stage turbine, D, coupled to the compressor from which, in turn, the main generator, E, is driven through reduction gear, F. From the turbine the gases pass through the recuperator, giving up heat to the air entering the combustion chamber, and are exhausted to atmosphere through the roof of the locomotive at G. Actually, the turbine delivers about 10,300 h.p., but about 7,800 h.p. is absorbed in driving the air compressor. The plant is assembled on a bedplate and can be swung on a crane as a complete unit for installation in the locomotive.

The complete locomotive weighs about 117 tons and has a tractive effort of 32,600 lb from starting to 21 m.p.h. and a continuous tractive rating of 12,600 lb at 64 m.p.h. The drive is by four traction motors to the outer axles of the two three-axle bogies. Controls are duplicated for driving cabs at each end of the locomotive to permit running in either direction without turning. A small diesel-engine generator set is incorporated for starting and auxiliary services. Steam for carriage heating is raised in a small oil-fired boiler.

In order to operate with British rolling stock equipped with vacuum braking, two exhausters, one driven by an electric motor and the other by vee-belts from the main generator shaft, are fitted instead of the compressor used for the Continental pressure braking system.

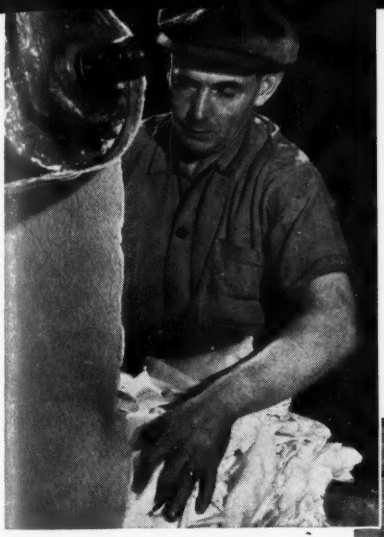
A brief description of the Metropolitan-Vickers turbine locomotive was given in the *Electrical Review* of 24th January, 1947.

Students' Vacation Work

THE fifteenth annual report on the vacation work scheme of the Imperial College group of students shows how acceptable this service has become. The year 1949 was, incidentally, the first during which the Vacation Work Committee acted as the "clearing house" for students of affiliated colleges in this country taking part in the I.A.E.S.T.E. (International Association for the Exchange of Students for Technical Experience) scheme.

Some 200 manufacturing and research organizations are accepting students during the summer; 77 also receive foreign students and 57 of the total are electrical concerns. During the summer of 1949 students at home and abroad had 5,963 weeks' experience and received £24,360 in remuneration; 149 students of the Imperial College obtained practical experience in nine countries abroad and the same number of exchange students were placed in British industry.

Recognition of the Association by the Ministry of National Insurance enables all sponsored overseas students to be charged 4d a week for coverage of industrial injuries, instead of 4s 11d, and income tax is not charged on the remuneration they receive during their practical training.



Bleached straw pulp being discharged from the press-pâte ready for the paper mill

Paper from Straw

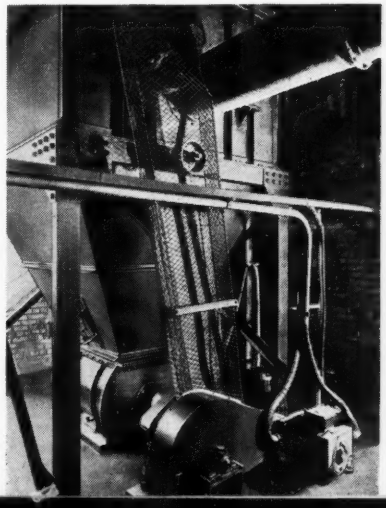
Electrical Requirements of a New Industry

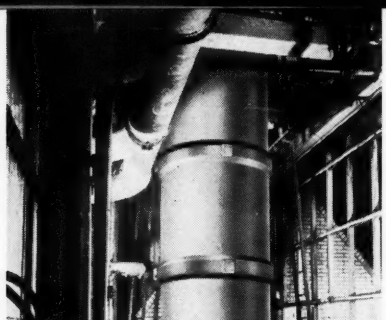
BESIDES saving the importation into this country of a very substantial quantity of wood pulp—pre-war about 1¾ million tons and over a million tons in 1948— the utilization of straw for the manufacture of paper and board provides an almost ideal electrical load. The processing of the straw can be carried out as a continuous operation and virtually all of the many electric motors required, as well as electrolytic apparatus for the production of chemicals, are in circuit the whole time.

A complete pilot plant established by the Cellulose Development Corporation, Ltd., to perfect and demonstrate the continuous soda chlorine process (known as the Celdecor-Pomilio process) has been in successful operation for nearly ten years at St. Paul's Cray, Orpington, Kent. In addition, there are a dozen full-scale production plants in various parts of the world. Several other plants are in the process of construction, and recently that of the Compagnie Nord-Africaine de Cellulose ("Cellunaf") in Algiers has gone into operation. This mill is the world's first all-continuous fine pulp and paper mill, there being no batch processing whatever between the initial treat-

The straw brought in by a conveyor is first cut by this machine into pieces about 2in in length

The cut straw is then fed into this duster





The straw undergoes treatment and spends about two hours in a steam-heated digestion tower

ment of the raw materials (mixed straw and esparto) until the finished paper is reeled up at the end of the paper machines.

In the United Kingdom, Thomas Owen, Ltd., at Cardiff, and the Bowater Paper Corporation at Sittingbourne, Kent, have both been pulping straw for some years with plant supplied by the Cellulose Development Corporation. Between them these firms have proved under actual production conditions the soundness of the process in this country, and the Bowater Paper Corporation has in hand the erection of a complete new "Celdecor" bleached straw pulp plant.

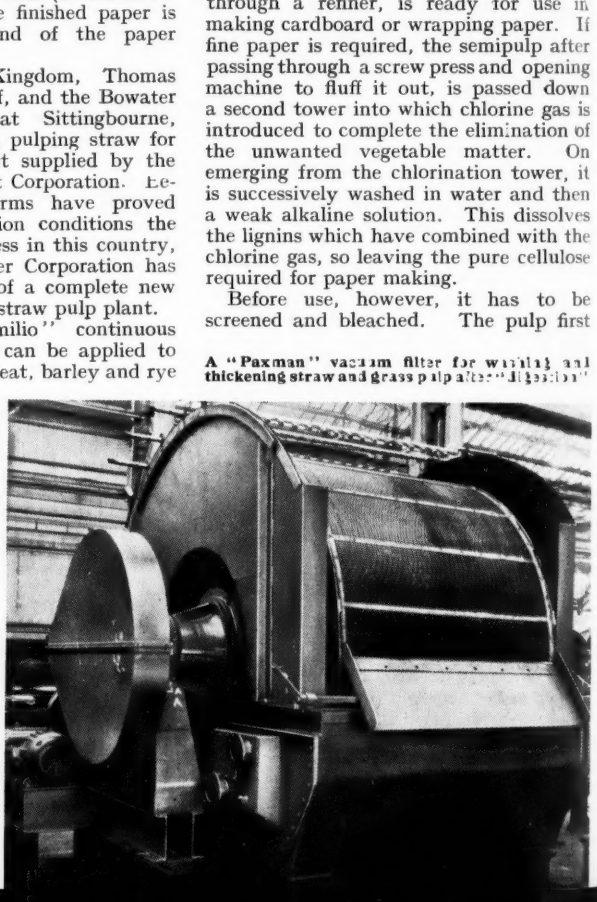
The "Celdecor-Pomilio" continuous soda chlorine process can be applied to any type of straw—wheat, barley and rye as well as rice straw—esparto grass and bagasse (sugar-cane waste), etc. The bales of straw are first fed from a conveyor to a cutter. In pieces about 2in long, the cut straw is blown up to the top of the pump mill building where it is cleaned and dusted. The straw is then discharged into a soaking machine containing a solution of caustic soda, where it absorbs an almost fixed ratio of liquor. The strength of the caustic soda solution is adjusted to ensure that the straw or other similar raw material picks up the appropriate amount of chemical.

The straw thus treated is admitted to the top of a continuous digestion tower which may be anything from 45 to 75ft high and is heated by low pressure steam (*e.g.* pass-out steam from a turbo-generator), partially in jackets and partially admitted directly to the interior of the tower. An extraction device at the foot of the tower ensures that the straw in descending by gravity takes approximately two hours to reach the bottom during which time it is thoroughly cooked or digested under the combined influence of steam and caustic soda.

Emerging from the digestion tower, the straw "semipulp" is washed on a vacuum filter and then, after being passed through a refiner, is ready for use in making cardboard or wrapping paper. If fine paper is required, the semipulp after passing through a screw press and opening machine to fluff it out, is passed down a second tower into which chlorine gas is introduced to complete the elimination of the unwanted vegetable matter. On emerging from the chlorination tower, it is successively washed in water and then a weak alkaline solution. This dissolves the lignins which have combined with the chlorine gas, so leaving the pure cellulose required for paper making.

Before use, however, it has to be screened and bleached. The pulp first

A "Paxman" vacuum filter for washing and thickening straw and grass pulp after digestion



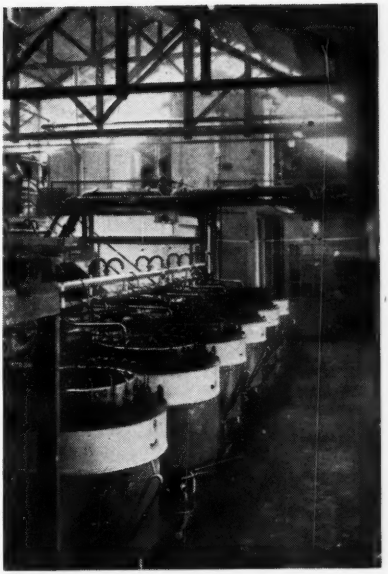
goes through a shaking screen which removes the undigested nodes, weeds, heads, etc. Following this coarse screen, the stock is discharged into a sand-trap where the heavy particles separate out. After going through rotary fine screens and dirt removers, the stock is now ready for thickening and the addition of bleach liquor. This is added over a screw conveyor which carries the pulp to a succession of bleaching towers. In these, it spends in all about 8 hours before emerging on to a press-pâte, which discharges the finished pulp in the form of a thin continuous web. The pulp is then ready for use in the paper mill, and it may be dried if transport over a distance is required.

Achievements of Pilot Plant

The pilot plant at St. Paul's Cray was designed to handle one ton of straw pulp an hour, but it is actually operating at three times this capacity. Modifications in hand will further increase the capacity to 5 tons an hour. At the St. Paul's Cray plant the electrolytic equipment which normally would produce the caustic soda and chlorine required for the process, was damaged in the war and has not been replaced. The process can quite well operate on bought chemicals, but since use can be made of the caustic soda and chlorine gas in just the condition and proportion that they are produced from the electrolysis of common salt, it is obviously much more economical to install such a plant in full-scale operation.

A suitable electrolytic plant for the production of one ton an hour bleached straw pulp would require about 700 kW of d.c. supply at about 3,000 A. The pumps and machinery motors in the actual pulp mill would, generally speaking, have a maximum demand of about 450 kW for the same pulp capacity. In larger installations the power requirements per ton of pulp produced would be reduced to 350 kW. For every 100 tons of straw treated, 40-42 tons of bleached pulp suitable for fine paper can be produced. Satisfactory paper can be made wholly from straw pulp, while with 50-75 per cent straw pulp really first-class papers can be produced.

As the United Kingdom is estimated to have at least one million tons per annum of straw surplus to agricultural requirements, there is no lack of raw material, and its conversion into paper and board would undoubtedly make a substantial contribution towards assisting the country's economic recovery and at the same time help to conserve the world's timber resources.



"C.A.S.A.-Pomilio" cells which produce the chemicals for bleached straw pulp production

Prospects in Ireland

AT the recent inauguration of a local rural electrification scheme in Co. Meath, Mr. Liam Cosgrave, Parliamentary Secretary to the Minister for Industry and Commerce, Ireland, said that the Government expected the demand for electricity to be doubled in a few years. In 1929-30 the E.S.B. generated about 60,000,000 kWh and the number of consumers was then less than 50,000. To-day generation was twelve times that of 1929, and the number of consumers was almost 300,000. Although the progress of the scheme had been slowed down by supply and labour difficulties, it had recently been possible to accelerate the work so that at the present date 63 areas had been completed. Those actually in course of development numbered 24. Twelve further areas had just been selected for development and, in addition, 130 other areas were the subject of investigation.

VIEWS on the NEWS

By REFLECTOR

IN last Sunday's *Observer* Mr. William D. Clark endeavoured to explain how it is that Switzerland, in spite of many natural handicaps, is a very successful industrial producer and exporter. Among the reasons he gives are that the Swiss with a very small home market have had to adapt their outlook and methods to overseas requirements; the 48-hour week is general; and technical education is highly regarded. Mr. Clark says that the absence of raw materials and of cheap bulk transport confines Swiss competition to the lighter classes of goods but he has overlooked the work of a number of world-important Swiss electrical and mechanical engineering concerns. His conclusion is that it would probably pay our industrialists to study Swiss productive methods as well as American, a suggestion with which I heartily agree.

★ ★ ★

As a means of improving attendance at meetings it was suggested recently at the Portsmouth Branch of the Electrical Contractors' Association that members should be asked to pay a deposit of twelve guineas a year in advance, a guinea being returned for each attendance at a monthly meeting. I am not surprised to read in the January *Electrical Contractor* that this was considered impracticable. It seems to me that it would be likely to scare members away from the meetings altogether.

★ ★ ★

The War Office has arranged with the British Electricity Authority to attach army technical men to Electricity Boards for training in the construction of distribution systems, etc. An account of his experience while attached to the Colchester District of the Eastern Board is given by a sergeant of the R.E. in the December *Eastern Electricity Magazine*. He is a little doubtful about "live" jointing which is resorted to in order to avoid interruptions and says that "military consumers are less fortunate than their civilian counterparts for, if a fault occurs, they are cut off irrespective of Sunday dinners." But I have the impression, after reading many Press reports, that civilians' Sunday dinners are invariably involved when a fault occurs.

★ ★ ★

In the West Kent district of the South Eastern Electricity Board an "overhead line school" has been set up to overcome a shortage of skilled linesmen and mates. For the position of instructor (reports "Seaboard") there was chosen "a first-class linesman of many years' varied experience who had been temporarily grounded for medical reasons." Is the word "grounded" used in the American or R.A.F. sense?

★ ★ ★

There is a very noticeable tendency for national boards to expand their titles and descriptions in order to be precise. All the same, I do not think it necessary, as a correspondent to the *Manchester Guardian* suggested the other day, that his payments for electricity should be sent to "The Accountant, The North Western Electricity Board, No. 7 Sub-Area, Box No. 2, Electricity Offices, Chapel Street, Hazel Grove, Stockport, Cheshire." I fancy that "N.W. Electricity Board, Stockport," would probably satisfy the Post Office.

★ ★ ★

I am afraid that I have little sympathy for the Devon "hikers" who recently received shocks from a farmer's electric fence. In the first place, it is said that the fence was 15ft from a footpath and so the hikers must have strayed off their course, and secondly, the shocks could not have been very severe—certainly not enough to "destroy the peace of mind of ramblers," as the secretary of the Pedestrians' Association is reported to have said. The people concerned uprooted part of the fence in protest—very high-handed action in the circumstances.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Ring Mains

AS one of the early advocates of the domestic ring main I feel that I must rush in and answer some of Mr. Milne's criticisms in your issue of 6th January.

Can there really be any argument as to reduction in wiring costs with the ring main? For the first time, small local authority houses are being equipped with an adequate number of general-purpose socket-outlets, anything up to a dozen according to the size of the house, all connected to one pair of 7/.029 cables and controlled by a 30A switch-fuse or a 30A way on the control unit. Is it in the least likely that this incomparable convenience would be afforded if the work entailed the running back of twelve separate circuits, with, to take the worst case, a twelve-way fuseboard and a 60A switch-fuse, at least?

I do not understand Mr. Milne's references to business premises, as Regulation 201 (C), and exemptions, is quite clear in its limitation of the ring main circuit to "private houses or residential flats."

I find myself in agreement with Mr. Milne on two points, however, but these have nothing to do with the ring main, as such. I could not agree more with what he says about inadequate and perfunctory earthing, but would point out that there is one wiring system—modesty forbidding me to be more specific—in which the earth circuit is also in the form of a ring circuit, thus affording additional security by reason of being connected at both ends. With this, the earth wire may be cut, but the third pins of the sockets remain earthed.

I agree with Mr. Milne also regarding the shortcomings of our standardized 13A socket-outlet, especially as to the possibility of the fuse clips being bridged with any size of wire; this is no fault of the ring main, but because we have standardized the wrong type of socket and plug. There was a better one previously available but we chose to ignore it, for reasons better left unmentioned. However, I invariably specify it when the opportunity arises and have experienced no difficulty whatever.

Unless spare ways have been left on the fuseboard, there is much more difficulty associated with the installation of an additional socket-outlet with the old method than with the ring main. In any case, is not the answer to Mr. Milne's fears regarding the making of extensions by unskilled persons the provision of an adequate number of points in the first place? I submit that the ring main is now ensuring this in a way that the old method never did, even when wiring was comparatively cheap.

Folkestone. T. C. GILBERT, M.I.E.E.

The Contractors' Future

I HAVE only just read my accumulation of *Electrical Reviews,* caused by the holiday. Reading the 16th December issue, I am surprised and disappointed to see a paragraph by "Reflector," beginning: "The fears of electrical contractors that they will be put out of business. . . ."

Let me assure "Reflector" (you seem to need no such assurance) that this fear does not exist. When a man is very ill, one does not talk lightheartedly about "the fear that he may soon be dead." The electrical contractor is not even very ill, and his early demise is extremely unlikely, so let us cease to harp on this imaginary "fear" and leave the electrical contractor to continue, by his own industry and enterprise, his fifty years' old tradition of service to the public.

Birmingham, 9. W. A. GAZARD.

["Reflector" says: "I have no fear for the contractors' future, but some contractors (judging by reports in local newspapers) do not share the confidence of Mr. Gazard and myself. It is upon these faint-hearted brethren that Mr. Gazard should bring his influence to bear."—Editors, *Electrical Review.*]

Inspection of Installations

IT would appear that Mr. L. C. Roberts, A.M.I.E.E. (*Electrical Review,* 30th December), is out of touch with national

and trade papers if he has not heard of the Electrical Contractors' Association and its guarantee of work scheme. Does he think that electrical contractors are less to be trusted than the Electricity Boards?

I concur with the remarks in his ultimate paragraph. R. E. BRISTOW,
Guildford. A.M.I.E.E.

Welsh Water Power Proposals

MR. A. R. Cooper in his broadcast remarks, reported in your issue of 30th December, suggested that the opposition to the North Wales hydro-electric proposals should stop opposing change and ensure that the change was good. But that is what we are in fact doing.

The issue is simple: change is inevitable in the expanding economy to which we are committed and much that is beautiful in Britain must go sooner or later. Good planning can minimize the loss but it is merely foolish to argue that amenity will be increased thereby. It is wise therefore—and Parliament has endorsed that wisdom in the National Parks Bill—to name certain areas of outstanding interest and beauty before it is too late, and to say that development in these areas, at least, shall be such that it will not alter their intrinsic character. That is a very different thing from saying that no change of any sort should be allowed.

It does not, for example, exclude the possibility of promoting hydro-electric schemes for supplying rural needs, but it most decidedly excludes schemes of the magnitude and scope of those of the B.E.A. which, we argue, will introduce changes of a permanent and most undesirable character into the area. The plans are not essential to Britain's survival or economy, for there are alternative methods of meeting our electrical needs. But an irreducible minimum of unspoilt rural areas—and that is what we are fighting for—is essential to the country's general well-being. What they do in other countries when a principle is at stake has already been illustrated in the report from Swiss sources in your issue of 16th December: it was an interesting point to us who had always had Switzerland paraded as proof that you could have hydro-electricity and amenity happily commingled.

Liverpool, 3. R. J. TAYLOR
(North Wales (Hydro-Electricity) Protection Committee)

"Daily Mail" Television Photographs

OUR attention has been drawn to the article on page 1112 of the *Electrical Review* for 9th December and headed "Television Distorted," in which two pictures were reproduced from the *Daily Mail* with the statement that they had been used in that paper to illustrate the difference between 405 and 819 line television. These pictures, as the *Daily Mail* caption stated, were in fact of 450 line and 819 line definition. They were in fact both of French television. It was accordingly incorrect for our caption to state that these pictures represented a comparison by the *Daily Mail* between British and French television. At the same time it will be appreciated that the present British standard is 405 line definition with the result that the two pictures as originally published suggest an unfavourable comparison between the medium-definition form adopted by this country and the new high-definition form at present in an experimental stage in France.

Furthermore, in our view, the comparison between the two pictures is misleading in so far as the 450 line illustration has, without doubt, been distorted in that the picture has been elongated, an effect which is entirely unrelated to the number of lines employed in the transmission system: with the result that this distortion makes any true comparison between 819 line definition and either 405 or 450 line definition impossible.

We are now informed that the two pictures were both supplied to the *Daily Mail* as official pictures by Radio Diffusion Français and were published by the *Daily Mail* as received. We had no intention of suggesting that such distortion had been in any way deliberate on the part of the *Daily Mail* correspondent and would regret giving any such impression.

Illumination Arrangements

BLACKPOOL Electrical Services Committee has decided that, subject to the approval of the Town Council, the 1950 autumn illuminations shall be from 15th September to 23rd October.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE General Electric Co., Ltd., announces the retirement on 31st December of **Mr. A. A. Hooper,** registrar of the company since 1918. He is succeeded by **Mr. W. J. Druce.** On his retirement Mr. Hooper received a personal present of a gold wrist watch from Sir Harry Railing and at a farewell luncheon Mr. T. W. Heather, on behalf of his colleagues, presented him with a silver tea and coffee service. Mr. W. J. Druce, who joined the G.E.C. in 1919, started in the company's Share Department. He later held various appointments in the Order, Radio, E.L.S. and Accounts Departments before returning in 1925 as chief assistant to Mr. Hooper.

Mr. R. J. Pickard, B.Sc.(Eng), A.M.I.E.E., of Mill Hill, N.W.7, has been appointed an assistant controller (engineering), in the Department of Telecommunications, Federation of Malaya. Mr. Pickard was born at Leeds and educated at the Mercers' School, Holborn, and was an external student of London University. He entered the G.P.O. Engineering Department in 1939.

Mr. D. Holt, B.Sc. Tech., M.I.E.E., district manager, Wolverhampton, to the Midlands Electricity Board, has been appointed manager of the Central Gloucestershire Sub-Area of the Board, in succession to **Mr. G. D. Johnstone,** who resigned from that position on 31st December. Mr. Holt was educated at Manchester University and received his electrical training in the Rochdale Corporation Electricity Department, with which he later became mains assistant engineer (1924-33). He left Rochdale to become mains engineer at Walsall, and in 1942 was appointed general assistant engineer with that electricity undertaking, becoming engineer and manager in 1946. On vesting date he was appointed district manager, Walsall, by the Midlands Board, and became district manager at Wolverhampton in April last.

Mr. D. Holt

Mr. R. A. Erskine, M.A., M.I.E.E., chairman and managing director of Erskine, Heap & Co., Ltd., was to leave for an extended business tour of South Africa and Southern Rhodesia in the *Winchester Castle* yesterday (Thursday). He expects to return in four months' time.

Mr. G. P. Sutton, A.M.I.E.E., is retiring from the position of chief generation engineer (operation) of the Midlands Division of the British Electricity Authority on 19th January, when he will have served the electrical industry for fifty-one years of which forty-seven had been in public supply. Before taking up his present appointment, Mr. Sutton served the City of Birmingham Electric Supply Department for nearly forty-two years, rising from junior engineer at the Summer Lane station to generating stations engineer, being then responsible for the operation of all the Department's generating stations and the Birmingham system control.

Mr. G. P. Sutton

Mr. Sutton, who is president of the entomological section of the Birmingham Natural History and Philosophical Society, hopes to find more time in the future for his principal hobbies, entomology and horticulture. He is also interested in music, literature and drama.

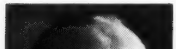
Mr. A. E. Norris, director and sales manager of J. G. Statter & Co., Ltd., will be leaving England for Egypt by flying boat on 20th January when after a brief stay he will proceed to Nairobi, Salisbury, Bulawayo, Johannesburg, Port Elizabeth, etc. Communications to him may be addressed c/o H.M. Trade Commissioner at these places. Mr. Norris will be returning from Cape Town on 7th April by the *Winchester Castle.*

Mr. J. S. Mitchell, who was formerly commercial manager for A. C. Cossor, Ltd., for many years, has joined Sobell Industries, Ltd., in an executive capacity.

Mr. A. R. Harrisson, who for more than thirty years has held the position of secretary of Cryselco, Ltd., retired on 31st

December after over fifty years' service with the company. At a farewell party given in his honour, attended by the directors and several hundreds of the employees on 30th December, many tributes were paid to him and presentations were made as a mark of the esteem in which he was held. **Mr. V. F. Perry,** C.A., succeeds him as secretary of the company.

Mr. P. C. Cooper-Parry, O.B.E., M.C., J.P., F.C.A., for reasons of health, has resigned the chairmanship of Newton Bros. (Derby), Ltd., and **Mr. F. V. Pipe,** A.M.I.E.E., managing director, succeeds him as chairman. Mr. Cooper-Parry has been presented by his co-directors with a George III silver tea caddy and framed photographs of the board and an enlarged portrait of himself.



Mr. F. V. Pipe

Mr. Pipe, who remains managing director, was associated for a considerable number of years with the British Thomson-Houston Co., Ltd. He joined Newton Brothers (Derby), Ltd., in 1918 as works manager and successively became London manager, general manager, and director, and eleven years ago he was appointed managing director. Mr. Pipe was for four years president of the Derby Association of the Engineering and Allied Employers' National Federation. For several years past he has been chairman of the Derby District Committee of the Regional Board for Industry and is an industrial member of the East Midlands Electricity Consultative Council, and a member of the General Council of the British Standards Institution.

Mr. J. Oldham, O.B.E., J.P., chairman of Oldham & Son, Ltd., Denton, Manchester, left for South Africa on 5th January in the *Edinburgh Castle* for discussions, following the setting-up last year of a subsidiary for the full-scale manufacture in the Union of portable electric mine lighting equipment. He will be joined there by the company's financial adviser and the chief engineer. Mr. Oldham is expected to return to England in March.

In announcing the appointment of **Mr. N. Elce** as a director and chief mechanical engineer of the Metropolitan-Vickers Electrical Co., Ltd., the company described him as M.I.E.E. This should have read M.I.Mech.E.

Mr. Ashley S. Ward, who has been chairman of Thos. W. Ward, Ltd., since 1941, has resigned from that office, but remains a director and will act in an advisory capacity. In recognition of his service the company has appointed him president as from 4th January. **Mr. G. Wood** has been appointed chairman and **Mr. F. R. Stagg,** deputy chairman. **Mr. H. W. Secker,** O.B.E., and **Mr. J. Walton** become joint managing directors, and **Mr. A. Carr,** hitherto in charge of London area operations, is to transfer his activities to Sheffield for other important work. **Mr. F. W. Robinson,** a local director, has been appointed to the board of the company and will take charge of London area interests.

Mr. A. G. Parsons, West Cornwall District manager for the South Western Electricity Board, has been appointed commercial manager of the Bristol Central District.

Mr. N. Axford, B.Sc., M.I.E.E., Harrow district manager of the Northmet Sub-Area of the Eastern Electricity Board, has been appointed manager of the Plymouth District in the Torquay & West Devon Sub-Area of the South Western Electricity Board, and took up his new duties on Monday last. Mr. Axford has taken a leading part in the activities of the Northmet Players and latterly the EDEEB Players. He is a past-president of the Harrow Rotary Club and of the Chamber of Commerce, has been a governor of Harrow Technical School, and is a member of the Association of Public Lighting Engineers.

Members of the staff of the Northmet Sub-Area of the Eastern Electricity Board and headquarters of the Eastern Division, **B.E.A.,** have combined to form the **EDEEB Players.** This society supersedes the original Northmet Players, and last week it presented for four nights at Church House, Southgate, a revue "More Current Events." As the title suggests this is a second edition of the very successful revue "Current Events" presented by the Northmet Players in 1947, and the new edition retains a strong Northmet flavour. The show is packed with humour, catchy tunes, good singing and some very efficient dancing by the EDEEB Sparklets. Mr. Norman Axford, who was responsible for the melodies, lyrics and sketches, also took part, and he had strong support on the comedy side of the production.

Mr. F. J. Erroll, who contributes a Parliamentary commentary to our pages, left by air, with three other M.P.s on Tuesday last on a goodwill mission to Burma.

Mr. W. G. Turner is retiring on 19th January from the position of manager of the No. 3 (Portsmouth) Sub-Area of the Southern Electricity Board. He is to be succeeded by **Mr. E. A. Logan.**

The annual staff dance of **Vactric, Ltd.,** was held in the Sir John Wilson Memorial

Hall, Airdrie, Scotland, on 16th December, when 400 members of the staff and their guests spent an enjoyable evening. The opportunity was taken by Mr. W. C. Pegley, managing director, to present his golf trophy to the winner, Mr. D. Black, of the accounts department.

An enjoyable evening was spent by the directors and staff of the **British Central Electrical Co., Ltd.,** on 22nd December. The party of forty first went to see the Folies Bergere Revue and then spent the evening at the Eccleston Hotel, Victoria, S.W.1, where a Christmas dinner was served. Bouquets were presented to Mrs. F. J. Conradi (chairman) and Mrs. G. Conradi. Mr. G. Conradi (general manager and director) in his speech thanked all the staff for their loyal support during the past year. He presented wrist watches and other inscribed gifts to long service employees.

The Sports & Social Club of **Rist's Wires & Cables, Ltd.,** gave a Christmas party to 650 children of its employees in the company's canteen on 17th December. Among the many activities of the Club is the Silverdale Silver Band which is taking part in a band contest to be held on 28th January in the company's canteen.

A large gathering assembled at the Prescot works of **British Insulated Callender's Cables, Ltd.,** on 20th December to pay homage to those from the works who laid down their lives in the last war. The service was led by Canon O. L. Martin, Vicar of Prescot, who was assisted by the Rev. Bernard Frost (Prescot Congregational Church) and the Rev. A. J. Trebilco (Prescot Methodist Church). A bronze memorial plaque bearing the names of the seventy-three fallen was unveiled and accepted into the keeping of the company by Ald. R. J. Hall, J.P. (director of B.I.C.C.).

On 21st December fourteen of the London area staff of B.I.C.C. received awards for completing twenty-five years' service with the company. The awards were cheques for £25 and the presentation was made by Mr. P. V. Hunter, a director of the company.

Presentations of long service awards were also made recently to employees at Erith and Prescot. At the Belvedere Works, Erith, fifteen awards were presented by Mr. W. G. Hendrey (director), while forty-nine awards were presented at the Prescot Works by Ald. R. J. Hall, J.P. (director).

OBITUARY

Mr. C. C. Atchison.—The death occurred on 2nd January at the age of seventy-eight of Mr. Charles Claremont Atchison, M.I.Mech.E., M.I.E.E., Wall Tyning, Bitton, Glos. Mr. Atchison was the first chief electrical engineer at Rochdale. At the time of his death he was chairman of the Warmley R.D.C. From the time of its inception, he was chairman of the Electricity Committee of the Warmley R.D.C. and served on the Joint Industrial Council for South-West England for many years as chairman. He was at one time a member of the Gloucestershire County Council and a J.P.

Mr. T. H. Varcoe.—The death occurred on Christmas Eve, after a brief illness, of Mr. Thomas H. Varcoe, A.M.I.E.E., manager of the Birmingham branch of Siemens Electric Lamps and Supplies, Ltd. Mr. Varcoe was born in Kansas City, U.S.A., in 1884, and joined Siemens Brothers Dynamo Works, Ltd., in 1912 as sales engineer at Birmingham. Two years later he became manager of the supplies department at Birmingham, and on the formation of the Lamp and Supplies Co. in 1920 was appointed manager of the Birmingham branch. Mr. Varcoe was an early member of the Birmingham Electric Club, of which he was hon. secretary in 1924-5, and president in 1928. At the time of his death he was president of the Midlands Radio Industry Golfing Society. Mr. Varcoe pioneered the installation of automatic telephones in many Midland works and business premises, and mine shaft signalling apparatus in Midland coalfields. During the war he took a very active part in civil defence work.

The late Mr. T. H. Varcoe

Mr. R. Stewart.—The death occurred on 4th January at the age of fifty-five of Mr. Ronald Stewart, construction engineer (transmission) of the South East Scotland Division of the British Electricity Authority. Mr. Stewart served in the 1914-18 war and then spent several years in New Zealand on hydro-electric schemes. He returned to Scotland in 1929 to take up an appointment with the Central Electricity Board as section engineer, serving at Galashiels, Portobello, Parkhead and Abernethy until vesting date when he joined the B.E.A.

Mr. A. M. Niven, A.M.I.F.E., who died in an Edinburgh nursing home on 31st December after a short illness, had been associated with Bruce Peebles & Co., Ltd., for over forty years. He took an active interest in the Edinburgh Electrical Society, of which he was hon. secretary and treasurer for many years. In 1947 he was elected

an honorary life member of the society in recognition of his services. Mr. Niven, who was seventy-two, was a native of Dundee.

WILLS

Mr. E. Atkinson, A.M.I.E.E., for many years with the Sheffield Electricity Department, latterly as assistant power station superintendent, who died on 6th April last, left £24,476 gross (£24,039 net).

Mr. H. E. Appleby, managing director of H. E. Appleby & Co., electric fire manufacturers, who died on 21st March last, left £21,073 gross (£21,014 net).

Mr. J. C. F. Smith, retired electrical engineer, late of the United Electrical Works, 159, Bermondsey Street, S.E.1, who died on 1st September last, left £23,194 gross (£23,138 net).

Major G. W. E. Hooper, T.D., F.C.I.S., secretary of the English Electric Co., Ltd., who died on 3rd September last, left £13,929 gross (£13,688 net.).

Mr. R. C. Snewing, until recently apprentice-supervisor with the B.T.H. Co., Willesden, who died on 30th October last, left £6,724 gross (£6,650 net.).

Mr. J. W. Russell, electrical engineer, chairman and managing director of J. W. Russell, Ltd., Watford, who died on 30th October last, left £208,109 gross (£205,286 net.).

Mr. F. Jackson, formerly engineer and manager of the East Dereham U.D.C. electricity undertaking and senior executive officer (East Dereham) Eastern Electricity Board, who died on 2nd September last, left £581 gross (£544 net).

Mr. A. B. Spencer, employment officer with the British Thomson-Houston Co., Ltd., who died on 4th November last, left £2,882, gross (£2,579 net).

Mr. H. S. Lambert, of the Imperial Lighting Co. (Implitico, Ltd.), electrical engineer, who died on 28th August last, left £13,681 gross (£13,623 net).

NEW BOOKS

Electric Cables. By F. W. Main, M.I.E.E. Third edition. Pp. 142; figs. 52; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 12s 6d.

The first edition of this book was published in 1922 and it has now been revised and extended to include the advances which have subsequently taken place. In his preface the author states that the book is written "in a descriptive style to interest the general reader" and it undoubtedly provides a very excellent outline of the subject.

The design, construction, testing and installation of all types of cable are clearly discussed. One chapter deals with super tension cables but the relative merits of oil-filled and gas-filled cables are dismissed very briefly. A table of comparative wall thicknesses of insulation, electric stress values and temperature limits for 132 kV cables would be a useful addition.

The compression cable is explained in more detail but the advantages (and limitations) of the pipe-line type are not explained. Chapter VIII, on "quantities," would be more helpful if a wider range of formulæ could be given for computing the weight of the component parts of the cables (including dry core cables) and the basis should be explained for determining the lead wall thickness.

Since this book is an introduction to the specialized field of electric cables, the bibliography could usefully be expanded in future editions, and the publisher's name added to each reference quoted. The volume is essentially of a practical nature and will be of considerable use to all who require a sound introduction to electric cables.—C. C. B.

Principles of Symmetrical Components. By C. A. Grover, M.I.E.E. Pp. 44; figs. 22. Classifax Publications, 9, White Moss Avenue, Manchester, 21. Price 4s.

This excellent little book forms a useful introduction to the fundamentals of the theory of symmetrical components and shows the way in which they can be utilized to calculate the voltages and current in unsymmetrical circuits. The subject is obviously not treated exhaustively in such a small book, but the author has done well in compressing the material so that no break in continuity occurs. Only essential information of the type most useful to students is included.—R. P.

H.V. Lightning Arrestors

RECENT PROGRESS IN DESIGN AND PERFORMANCE

By K. DANNENBERG,* A.M.I.E.E.

PROGRESSIVE recognition of the advance in knowledge of lightning and its effects on electric power systems during the last decade has established the modern lightning arrestor as a reliable means of protection, not only against lightning, but also against surge over-voltages which are either the result of indirect effects of lightning or of switching conditions.

Lightning discharge on to overhead lines creates travelling waves which comprise half electrostatic and half electromagnetic energy. The relief of the voltage and current magnitudes of the travelling wave depends on the ratio of the capacitance and inductance per unit length of the circuit in which it travels. The waves diminish with travel, the degree being dependent on polarity and wave shape. To provide protection for a specific piece of apparatus connected to the overhead system, knowledge of the wave shape is essential because it determines the characteristics of the most important component of the modern lightning arrestor, i.e., non-linear resistor, since it is subjected to the surge current and voltage wave when the latter passes the point of arrestor installation.

The modern lightning arrestor comprises an air gap which is mounted in series with non-linear resistors and is adjusted to a setting that ensures operation of the arrestor when the over-voltage reaches dangerous values, i.e., approximately 2.5 times the maximum line voltage to earth. A most important function of the air gap is the re-insulation of the line from the earth connection which is established if the over-voltage has flashed over the gap and allowed the surge energy temporarliy to establish an earth fault. It is, therefore, essential that this air gap shall be kept in good condition at all times, over many years of service. It is very necessary to protect it, not only from moisture which may cause oxidation when the arrestor is installed out of doors, but also to prevent the detrimental effects of condensation if—as is normally the case—the arrestor gap and resistor assembly are housed in a hermetically sealed porcelain.

A reliable method of hermetically sealing and safeguarding the gap construction has been found in the application of multi-compression joints to the arrestor housing and the simultaneous removal of the air from the interior of the arrestor assembly, replacing it with an inert gas.

The typical multi-compression joint (Fig. 1) shows that both joints are made under compression by first spinning and thereafter rolling the cap directly on to porcelain. The surface of the porcelain was rubberized before the cap was spun. A non-return valve is used for filling the

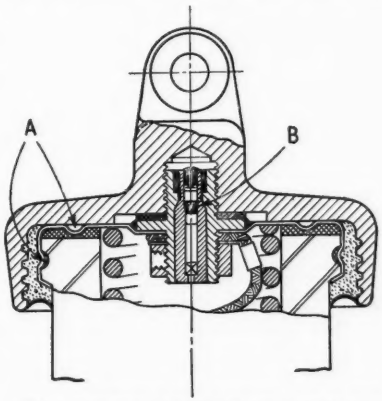


Fig. 1.—Method of hermetically sealing and safeguarding high voltage lightning arrestor
A, multi-compression joints. B, non-return valve.

* Director, E.M.P. Electric, Ltd.

interior with an inert gas, normally at atmospheric pressure; it is, however, used during the assembly operation as a testing medium for all joints by providing excess pressure in the arrestor interior which at the end of the testing period is released before the valve is finally sealed.

In broad terms insulation co-ordination consists of the adaptation of the insulation of the apparatus to be protected to the anticipated over-voltages. It requires a knowledge of impulse voltage characteristics of the apparatus to be protected and the impulse protective characteristics of the lightning arrestor.

There is a keen tendency to place increasing dependence on the protection of apparatus by modern arrestors and to base insulation requirements of the apparatus to be protected on the arrestor level. This has become a practical proposition, since non-linear resistors can now be manufactured in such a manner that the crest IR drop across them will practically reach the maximum over a wide range of surge current values and will not appreciably increase above this value at higher surge currents. It is, therefore, possible to determine the protection level of the arrestor as a definite figure. In the past, arrestor characteristics were, of necessity, such that increased surge current caused a corresponding increase of IR drop across the arrestor which made it impossible to arrive at an accurate estimate of the maximum volt drop, since the value of surge current could not be anticipated.

The set of the new surge current-residual voltage curves for an arrestor range operating at from 250 V to 132 kV (Fig. 2) shows that the increase in volt drop across the arrestor is very small when surge current values in excess of 10,000 A are considered. It is, in fact, possible to consider the residual voltage curve as becoming asymptotic and thereby decide the crest residual voltage value at maximum current (whatever value that may be) and compare it with the impulse breakdown voltage of the transformer or similar apparatus.

"Hot" and "Cold" Lightning

It was believed for many years that the crest magnitude of surge current was of major importance and arrestor design was considered from the angle of the surge capacity of the assembly in regard to maximum surge current.

Both laboratory investigations and field studies during the last few years have shown that this consideration of maximum surge current capacity of an arrestor was not necessarily correct, since the majority of lightning disturbances on overhead lines—particularly if networks up to and including 33 kV are involved—are of an indirect nature.

Surge current waves having peaks of very high values, of the order of 30,000 or 50,000 or even 100,000 A, have very short tails, as has been established by researches carried out both in this country

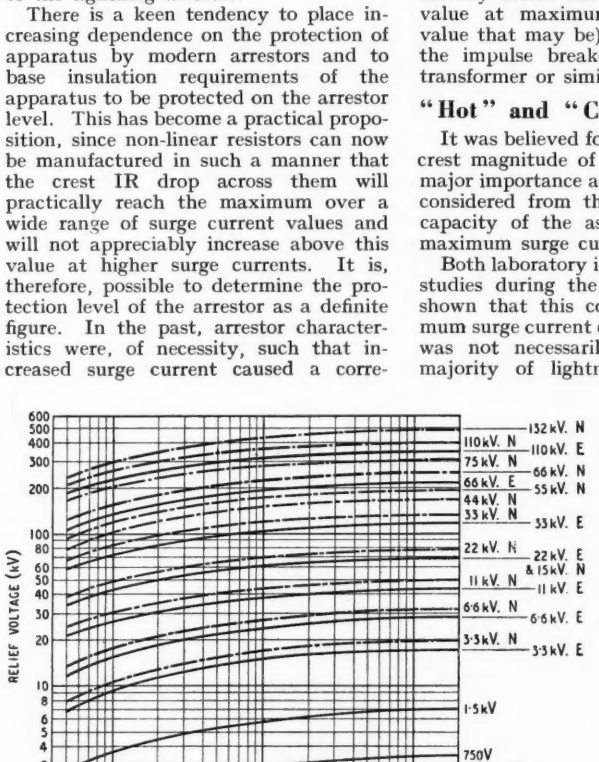


Fig. 2.—Residual arrestor characteristics for 50 microsec surge current time constant

kVN signifies insulated neutral, kVE signifies earthed neutral.

and in the United States. In this connection reference may be made to a number of publications by Mr. B. H Gelde, both in the I.E.E. *Journal* and in the *Transactions* of the American I.E.E.

Indirect surges on networks can have time-constants of very much longer duration than was originally assumed, but certainly in excess of the 20 microsecs which until a few years ago was considered to represent reasonable maximum for the surge current time-constant of lightning travelling waves.

The average indirect current surge is now known to last over a period ranging from 20-75 microsecs, or even longer. This necessitated the re-design of the arrestor assembly with the object of increasing its thermal capacity.

The surge capacity of modern lightning arrestors, therefore, varies with their capacity for dealing with long surge current time-constants. The expression "cold lightning" has been used with regard to surge protection by arrestors capable of dealing with a crest magnitude of surge currents having a 20 microsec time-constant and "hot lightning" for surge protection by arrestors capable of dealing with surge current waves having time-constants averaging 50 microsecs or even more. The importance of the latter arrestor range can be judged by the fact that arrestors which were proved to be capable of dealing with "cold" lightning currents of the magnitude of 50,000 A have failed when dealing with surge currents of only a few thousand amperes when their time-constants are of the order of 50 or 100 microsecs.

For indicating the performance of a new type non-linear resistor for use in arrestors capable of dealing with "hot" lightning surges (Fig. 3), both volt-time and current-time characteristics have been recorded by a double-beam, cathode-ray oscillograph and it will be observed that the time-constant of the current surge amounts to approximately 50 microsecs.

D.C. Arrestors

The clearance of the power follow-up current in a normal a.c. arrestor is usually dependent on the current zero-pause of the 50 c/s power follow-current. The normal non-linear resistor multi-gap assembly can, therefore, be considered unsuitable for use on d.c. circuits, particularly for traction application. The only possibility of extinguishing a d.c. power arc under simultaneous d.c. impulse and power conditions exists in the creation of a con-

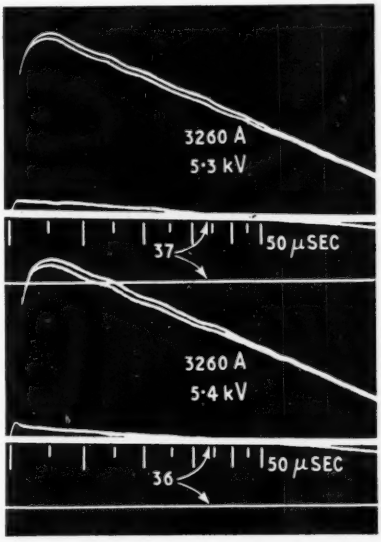


Fig. 3.—Cathode-ray oscillograph volt-amp-time records of new type non-linear resistor

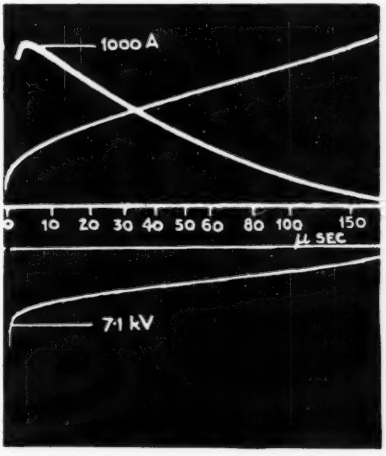


Fig. 4.—Oscillograph volt-amp-time record of direct current 1,690 V lightning arrestor

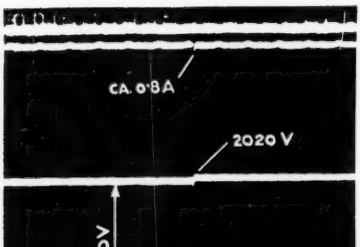


Fig. 5.—Follow-up current of d.c. 1,600 V arrestor under simultaneous power and impulse conditions

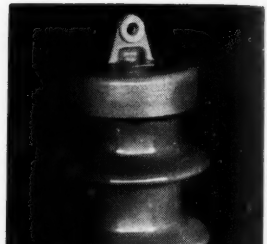


Fig. 6 (right).—Typical d.c. arrestor on shock absorbing phosphor bronze spring base for mounting on railway coaches

dition by which the d.c. arc becomes unstable and collapses. Such conditions can be created in a d.c. arrestor if the follow-up current is reduced to such small values and the d.c. arc sub-divided to such a degree that the volt-drop across each gap of the series gaps falls below 100 V. This leads to an automatic extinction of the arc. In order to prepare the conditions for the above assembly a new non-linear resistor material had to be created which is not only capable of passing high-surge current values, but also of decreasing the follow-up current to values well below 1 A without increasing the maximum residual voltage across the arrestor over 4-5 times the system voltage. This new material is now incorporated in a d.c. arrestor assembly which has been proved satisfactory for operating voltages up to and including 600 and 1,500 V, 3 and 6 kV d.c.

The volt-time and current-time oscillograms of the new arrestor under review (Fig. 4), with corresponding Dudell oscillogram (Fig. 5) indicate the follow-up current clearance of a typical d.c. 1,600 V arrestor.

For d.c. traction purposes, arrestors are usually mounted on the motor coach. Since rolling stock is exposed to considerable vibration, it is often useful to employ a shock-absorbing base (Fig. 6) for installation on railway equipment.

PRINTED CIRCUITS

INFORMATION concerning the Elargol process, which is now emerging from the development stage, has recently been released by Bakelite, Ltd. Essentially, the process is the replacement of pre-manufactured components, connected and fixed in a chassis by means of wires, screws and rivets, by a printed circuit capable of being applied by mass-production methods to a plastic material. The essential qualities of the latter are good electrical properties, ease of machining, dimensional stability and structural strength. It has been found by Ward, Blenkinsop & Co., Ltd., who developed the Elargol process, that a paper-based Bakelite laminated sheet meets these requirements.

In the Elargol circuit the wiring is part of the receiver chassis, and comprises a line of pure metallic silver printed on the plastic by a photo-offset method. Crossing of wires is effected by drilling through the plastic chassis and silvering the inside of the drilled hole. Another feature of the process is that components may be placed much closer to each other than in orthodox wiring methods.

It is claimed that the process can eliminate many operations in the mass production of receiver chassis, hearing aids, radar and electronic equipment of all kinds. The Bakelite laminated sheet employed (E.5089/1) has an average insulation resistance of over 500 MΩ after 24 hours immersion in water when tested by the methods laid down in B.S.1137 (1943).

The Year's Progress

Further Details of Manufacturers' Work in 1949

LAST year **Bruce Peebles & Co., Ltd.,** Edinburgh, increased outputs from all departments, and record shipments were made. A significant pointer in hydro-electric work is the number of contracts undertaken for projects at home and abroad, many of which carry full responsibility for the whole of the work on both the electrical and hydraulic sides. They included plants of up to 21,000 kW for the Scottish Highlands, machines up to 11,200 kW for Norway and two 10,000 kW generators and 15,000 and 10,000 kVA synchronous condensers for hydro-electric schemes in New Zealand.

Other contracts included nineteen 2,500 kW, 1,500 V rectifiers for railway electrification, two 1,000 kW glass bulb rectifiers for Edinburgh Transport Dept., 2,500 and 1,500 kW motor-convertors for India, and three 1,500 kW motor-generators for Australia.

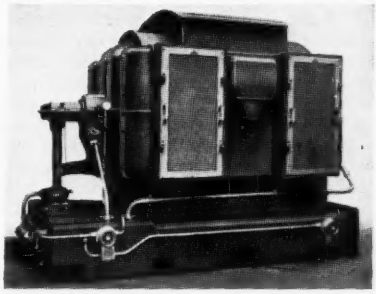
Besides three 1,750 kW geared sets for coupling to steam turbines for a fertilizer works in England, 5,000 kW of engine-type generators was despatched to isolated areas in Scotland where hydro-electric power cannot be made available, 940 kW machines to Uganda, a 770 kW machine to Australia and 700 kW and 525 kW generators to Egypt.

Four low-speed synchronous induction motors of 1,900 b.h.p. each are being made for South Africa, three for Australia and two for Portugal; 7,500 b.h.p. of large-diameter motors in sizes up to 1,200 b.h.p. for irrigation and sewage schemes in Australia; flameproof motors for mines in South Africa and Poland and for oil installations in other parts of the world.

Four 950 b.h.p. synchronous motors for the Dutch East Indies, with splash-proof and vermin-proof enclosures, have low-voltage internal heaters operated from a small transformer to prevent condensation inside while they are idle.

The growing trend in power stations towards the use of very large squirrel-cage motors for direct-on starting is

Bruce Peebles 2,050 b.h.p. 3,000 r.p.m. squirrel-cage motor for a boiler feed pump



exemplified by a 2,050 b.h.p. 3,000 r.p.m. motor completed for driving a boiler feed pump at Portobello. Its streamlined, surface-cooled rotor has "keyed" conductors to prevent vibration during starting and secure axial anchorage of the complete "cage." The windings occupy only a proportion of the slots, the remaining space being used as an air duct and to provide the reactance required to limit the short circuit current. The motor is provided with air filters, forced oil lubricated bearings, gear-driven oil pump, valves, flow indicators and pressure gauges.

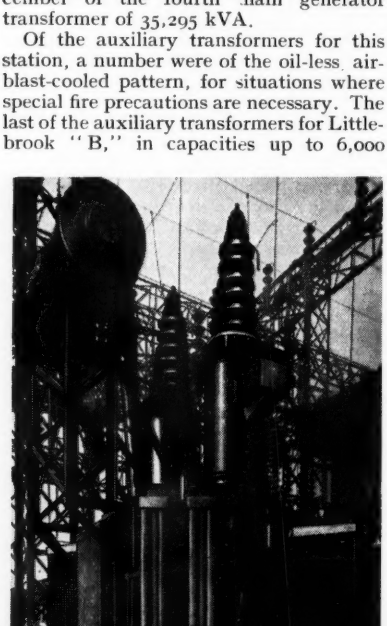
Orders for transformers set up a new record of 1,500,000 kVA with a sustained demand from overseas. The first of two 75,000 kVA generator transformers for Portobello, the largest ever built in Scotland, was completed last year. Duplicate 100 per cent forced air cooling is employed, the oil being pumped through a nest of small-bore tubes housed in a jacket through which cooling water flows. Motors driving the pumps receive power from an auxiliary transformer switched in simultaneously with the main transformer. Failure of a pump causes change-over to the stand-by automatically and gives an alarm signal.

Four three-phase oil-immersed magnetically shielded reactors were completed

for Portobello, each capable of dealing with a fault of nearly 500,000 kVA, and believed to be the largest oil-immersed units of their type built in this country. Overseas transformer shipments included four of 5,400 kVA for Canada; four 4,575 kVA rectifier transformers for South African Railways; two of 5,000 kVA for Sweden; and two of 1,200 kVA for Uganda.

An exceptionally busy year is reported by the **Hackbridge & Hewittic Electric Co., Ltd.** The company was responsible for all the main and auxiliary transformers for the Kingston power station, amounting to over 170,000 kVA, which contract was completed with the delivery in December of the fourth main generator transformer of 35,295 kVA.

Of the auxiliary transformers for this station, a number were of the oil-less air-blast-cooled pattern, for situations where special fire precautions are necessary. The last of the auxiliary transformers for Littlebrook "B," in capacities up to 6,000 kVA and totalling 34,500 kVA, was delivered in 1949.



Single-phase 132 kV Hackbridge reactors with naturally cooled detachable radiators

Two 60,000 kVA, 125,000/66,000 V, three-phase, water-cooled units with on-load tap changing equipment were shipped to the Shawinigan Falls power station in Quebec, Canada, and put into service in the autumn. With a weight of 111 tons each and an overall height, when installed, of 26ft, these are among the largest transformers exported from Great Britain, and the value of the contract was then over a quarter of a million dollars.

Two 12,000 kVA, 42/63/6.3 kV three-phase transformers were dispatched to Portugal for operation at the Seia hydro-electric station of Empresa Hidro Electrica da Serra da Estrela; restricted access and transport facilities made it necessary so to design them that they could be dismantled down to the component cores and winding assemblies, with the tanks also in three sections, and quickly reassembled after delivery to site. On-load tap changing connections and all other interconnections were arranged in sections with bolted joints to reduce the labour of reassembly.

A 16,000 kVA 115/10.5 kV transformer for Finland has on-load tap changing equipment on the 115 kV side; the selector switch mechanism is mounted above on a massive porcelain insulator to permit reduction of dimensions for high-voltage operation with a fully insulated neutral. This transformer is now installed at Oulu power station and will operate at exceptionally low winter temperatures.

Now in the final stages of manufacture is a 60,000 kVA 132/33 kV three-phase transformer with on-load tap changing equipment for the Huncoat power station, this being one of a pair.

Among reactors installed during the year were a number of 90,000 kVA at 132 kV single-phase for B.E.A. substations at Coventry and Ocker Hill.

A feature of the company's rectifier output has been the high proportion for overseas installations, typical examples being 1,250 kW equipments for the Toronto Transport Commission, 1,000 kW equipments for tramway and trolley-bus services in Hobart and a number of 750 and 375 kW rectifiers for transport services in Dunedin, N.Z.

There has been an increasing demand for rectifiers for the operation of heavy d.c. driven machinery in steel works and other engineering plants. One overseas contract is for over 26,000 kW of rectifiers arranged in banks of up to 5,000 kW capacity at 480 V three-wire.

The cabling of the Littlebrook "B" power station, which is nearing completion, has been carried out by **W. T. Henley's Telegraph Works, Ltd.** The scope of this work has ranged from the 132 kV oil-filled feeders and 20 kV and 6 kV transformer connectors to a large number of medium-voltage auxiliary power and control circuits throughout the station. The total length made and installed by Henley's is 30,000 yards.

The "Group 24" distribution pillars introduced in 1949 are suitable for three-phase, four-wire systems. They are designed to accommodate wedge-type cartridge fuse-links on the phases and for a fifth core, if required, cartridge fuse-link protection can be provided. Four sizes are available, the largest continuously rated at 1,000 A. The conductor fittings are interchangeable and also reversible, so that crossed cable cores are avoided. The insulators have tapered holes which facilitate the insertion and the removal of the conductor fittings. Ammeter sockets or ring-type current transformers can be fitted to each type, except those rated at 1,000 A, and, when required, selective busbars are provided.

During the past twelve months the activities of **Ferguson Pailin, Ltd.,** have included the completion at the Walsall power station of a 33 kV 1,500 MVA switchboard, controlling the generation, together with the 500 MVA switchgear and comprehensive control equipment; extensions to the latter board are now in course of manufacture.

At the Portobello station a seven-panel 33 kV 1,500 MVA generation switchboard and two nine-panel 33 kV 750 MVA main distribution boards have been completed.

Work in the factory has recently been started on the gear for Chadderton, fifteen 33 kV 1,500 MVA units on the generator busbars and sixteen 33 kV 750 MVA units on the distribution busbars, with full control equipment. Also for the north west, a number of 33 kV ring main equipments are at present in hand with other 33 kV switchboards for distribution in this area.

The outdoor 33 kV substation at New Mills has been equipped with 500 MVA type ROP.32 oil circuit breakers, with isolators and control equipment; further gear for this substation is at present being manufactured. For a 132 kV outdoor station at Bromborough type XOPR.54 oil circuit breakers, 132 kV isolators and all ancillary equipment are being built; control of this gear will be from the adjacent power station, for which are also being manufactured indicator, control and relay boards with busbar protection for both 132 kV and 33 kV switchgear. The installation of the first section of a 132 kV switching station at Beauly, near Inverness, is nearing completion. In addition 11 kV and 6.6 kV switchgear have been put into service for various Area Boards and for industrial consumers, while the production of 400 V switchgear for industrial concerns has been maintained.

Production for export reached its highest level in the history of the company. Work is proceeding on several switchboards for various South African and Rhodesian municipalities and mines.

Extension equipment for South Fremantle power station auxiliaries has been completed, while for Melbourne 90 oil and compound-filled 250 MVA equipments are in hand. Various extensions are also going ahead at the Waverley, Camperdown and Paddington substations of the Sydney County Council.

A thirteen-panel 22 kV 1,000 MVA single isolated, double bus metalclad switchboard of the VTRP.13/3 type goes to the New Zealand State Hydro Department at Penrose and for Dunedin, too, an 11 kV 500 MVA power station switchboard is nearing completion.

The shipment to India this year of high voltage outdoor breakers, principally for the Central Provinces and Madras Governments, included a 110 kV "Duo-Blast" air breaker.

In Turkey 15 kV and 6.6 kV switchgear will control power required for a new world range radio station.

High voltage switchgear is going to Gibraltar and Sekondi while Malaya has received large quantities of BV units; Hong Kong supply has been reinforced by shipments of low voltage gear with additional contracts in hand for high voltage distribution switchgear.

Furnace Heating

Aspects of Metallurgical Practice

EXAMPLES of the ways in which mechanization and instrumentation have improved the all-round performance of furnaces for the heat-treatment of metals are given in a paper which Dr. R. J. Sarjant (Professor of Fuel Technology, University of Sheffield) contributed recently to the Institution of Mechanical Engineers.

An important (frequently unknown) cause of loss of efficiency in metallurgical installations is the absence of knowledge of the manner in which the rate of fuel consumption should be varied to suit the fluctuating demand of the furnace for heat. The paper therefore commences with a commentary on the computation of heat transmission into the furnace structure and into the charge within the furnace, leading up to a method (applicable to the flow of heat in more than one dimension) based on an electrical analogy, which was developed by the author independently and without knowledge of similar work in Sweden and the United States.

Time-Temperature Curve

Thus the flow of heat and changes of temperature may be determined by observing the time variations of electrical phenomena within appropriate circuits of a computing machine. This comprises a number of potentiometers connected to a source of constant d.c. (100 to 250 V) beneath and at right angles to which a table is moved at constant speed through reduction gearing by a synchronous a.c. motor.

The moving table may be replaced by rotating cylinders carrying recording charts. One of the potentiometers may be used to simulate the input temperature variations, the time-temperature curve being drawn on a chart fixed to the top of the moving table. The output potential of the circuit, corresponding to the output temperature of the furnace, is observed by a null method with a quadrant electrometer, which enables the pencil of the output potentiometer to trace the time-temperature curve required as the solution of the problem put into the machine.

In the same way the cooling of a furnace wall by radiation and convection to its surroundings can be determined by a device employing a third potentiometer to introduce the effect of the external heat loss. The converse is also possible, as when allowance must be made for heat transfer to the surface of a mass which is being heated in a furnace.

Allowance for latent heat effects may be made either by introducing the value, as in the case of phase transformation in metals, with the specific heat, or by means of auxiliary capacity circuits inserted and withdrawn at the voltages corresponding to the temperature ranges involved.

Machine methods of determining soaking times are important because in the absence of reliable data the tendency is to allow too long a time as a safety margin to safeguard the quality of the product.

The second half of the paper is descriptive of several forms, some unusual, of power-driven conveyance of materials through furnaces and automatic control of heating media.

Electronics Symposium

IN November, 1948, the Scientific Instrument Manufacturers' Association held its first symposium on electronics as applied to scientific research and industry. Altogether eleven papers were read by experts in some particular field of application, and these, together with the subsequent discussions, have now been published in the form of a book containing 197 pages, well illustrated and with references to other literature. This book, which has been produced under the editorship of Mr. A. G. Peacock, secretary of the Association, has been published by Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2, price 16s.

Network Calculations

New Analyser Board at Nelson Research Laboratories

LAST week we visited the Nelson Research Laboratories of the English Electric Co., Ltd., at Stafford, to inspect the new a.c. network analyser board which was recently inagurated by Sir John Hacking, deputy-chairman of the British Electricity Authority. This piece of apparatus is a computer of the analogue type and it has been built primarily for the company's own use as an aid to the design of equipment for power systems, but facilities will be offered to other organizations which cannot solve their network or similar problems so conveniently.

When designing new systems or planning extensions to existing power networks the engineer is often faced with many alternatives, each of which would require far too much labour to investigate adequately by normal methods. This inconvenience is overcome by using equipment such as the calculating board at Stafford as it provides a universal set of components which can be preset to represent the characteristics of the lines, transformers or machines in any system. After connecting these up to form a model of the system under investigation, voltages, adjustable in phase and magnitude, are injected at the points corresponding to the generating stations and measurements of voltage, current and power made throughout the model.

To permit interconnection of the units forming the network, leads are brought from each one to a central plugboard. The units themselves are arranged on either side in cubicles to form a horseshoe and give the operator ready access to the switches on the front panels. On the floor within the horseshoe is situated the control desk, housing the meters and metering selector controls. Once the units have been interconnected at the plugboard and adjusted to simulate the components in the system under study the operator, by manipulating the switches on the control desk, can automatically select any point in the network and measure voltage, current and power.

By the use of numerical conversion factors, a power system can be simulated at any convenient base voltage and current. A reasonable size and satisfactory power consumption is attained by choosing 50 V 50 mA. A frequency of 500 c/s is also chosen to reduce the size of the iron-cored reactors.

Power is supplied by a 250 V 500 c/s three-phase alternator of particularly good wave-form, which has electronic stabilization to control voltage and frequency to within one volt and one cycle per second. The three-phase supply feeds a bank of transformers, each with several tappings or secondary windings, which are interconnected in such a way that nineteen voltage sources are available, all equal in magnitude but differing in phase by steps of 10 deg.

General view of the a.c. network analyser at Stafford with the control desk in foreground

The analyser units representing generators must provide a voltage source variable in both magnitude and phase. Variation of phase in steps of 0.5 deg is obtained by switching to a suitable pair of voltage vectors spaced at 10 deg from the coarse phase-shifting network.

Voltage is varied in 25 coarse steps of 10 per cent from 60 per cent to 300 per cent of the base analyser voltage, by means of taps on the coarse voltage transformer. In series with this is a fine voltage transformer which provides twenty 0.5 per cent steps. This system provides voltage sources with very good regulation dependent only on the design of the component transformers.

With base voltage and current of 50 V and 50 mA, the basic impedance is 1,000 Ω. It has been decided to cover an impedance range of from 1 per cent to 5,000 per cent of basic impedance and to do this with three ranges of impedance units, low, medium and high, all of which can be set in both magnitude and phase. The low units, from 1 per cent to 50 per cent, cover the range normally required to simulate transmission lines, while the medium units, from 10 per cent to 500 per cent, cover the normal requirements for loads and synchronous machines or transformer impedances. The high impedance units would normally be required only for very small loads or leakages on transmission lines. All the impedance units, however, perform a similar function and are not restricted to the uses which are suggested above.

Nearly all impedances encountered in power systems fall within the range catered for in the units described above, but a number of units with separate decades of resistance and inductance are included for setting up loads of unity power factor.

Tap Changing and Mutual Coupling

In order to include the effects of line charging currents two decade capacity units are provided which cover the range from 1 per cent to 100 per cent of the base admittance which is 1/1,000 mho. Included in the design are a number of auto and double transformers, which will be used to study the effects of tap changing and for introducing the mutual coupling sometimes required between circuits.

Readings of voltage, current, watts and reactive power at any point of a network are taken at the control desk on which are placed the remote controls of the metering system. The voltmeter, ammeter and wattmeter are fed from electronic amplifiers with large current feedback to eliminate drift due to variation or ageing of valves, which can provide ample power to operate the instruments without placing any significant burden on the network under test. The amplifiers are fed by range transformers which have four taps selected by relays to give sensitivity ratios of 1, 2, 5, 10. Connection of the amplifiers to any point of a network at which readings are required is made by means of telephone type uniselectors.

Methods of Operation

All leads from the various analyser units terminate in sockets on the plug board. On the front are engraved symbols and references to the units terminating at each point. The network to be studied is set up with jumper leads plugged to connect the units required to simulate its various power stations, transmission lines, transformers and loads. The current in any unit is then a measure of the voltage drop in its associated shunt. At the back of the board leads are taken from the terminals for each unit, one pair to measure the voltage drop across the shunt and another pair to measure the voltage directly across the unit. These leads are connected to the contacts of the uniselectors which have channels to carry eight separate circuits.

By rotating dials on the control desk the uniselectors connect the amplifiers to the four metering leads associated with any unit. Beneath the plugboard are housed the relays controlling the uniselectors and also metering relays actuated from the control desk. Provision has also been made for relay and phase shifting networks to perform the automatic summation of the currents and voltages in the three sequence networks of a symmetrical component study and to give direct readings of these quantities for the three separate phases. Along the top of the plug board low consumption meters have been provided for approximate indication of loads during the initial setting up of a network.

Apart from power system problems, the analyser can be used to solve such dynamic and structural problems as can be reduced to an electrical analogy. Although it operates at a fixed frequency and gives a steady state solution, variations of frequency or the study of harmonics can be accommodated by changing the constants of the circuit and step by step methods can be used to extend its use to the study of some transient phenomena.

AUTOMOBILE ELECTRICAL EQUIPMENT

Recent Modifications and Improvements

ELECTRICAL accessories for passenger motor cars are the subject of a paper prepared by Mr. M. W. Kendall (deputy chief engineer, Joseph Lucas, Ltd.) for presentation at the Institution of Mechanical Engineers.

The paper describes present-day equipment, explaining why and how it differs from American designs. It shows that, while striking changes have not come about, scarcely any of the 1939 products have remained unmodified. Starting with the generating and storing system, it is shown that the complete a.c. system, which is attractive, is impracticable at present because of the need to convert to d.c. for battery storage purposes. Dynamo life and performance have been greatly improved since the constant current (third brush) system began to be replaced in 1935 by the compensated voltage control system in which a pair of spring contacts vibrates open and closed in a manner to provide an average field current. It has thus enabled the machine rating to be improved, the generator output and speed to be increased, the brush life to be extended considerably and the battery life to be lengthened.

Following these major changes, two other post-war developments have been, first, improved enamel coating for copper wire (polyvinyl acetate-phenol formaldehyde), which has brought about economy of space; secondly, a further increase of belt drive ratio in the case of smaller machines, which has raised the armature speed when the car is in top gear, while die-cast aluminium alloy endplates have also been introduced. In consequence of these improvements a 12 V generator of 250 W capacity is now available, weighing 12.5 lb as compared with about 22 lb for its 6 V counterpart of conventional design.

The compensated voltage control system is still quite a satisfactory service, though a limit to its ultimate usefulness can now be seen. If the electrical loading of passenger cars continues to grow it may be necessary to provide two such regulators, with their contacts in series in the generator field circuit, one being shunt wound and responsive to voltage and the other being series wound and responsive to current only. The engine starting capability and low-temperature performance of storage batteries have been improved by modifications of based grids and terminals, while various changes in arrangement and appearance have also taken place. The main object has been to conserve lead, which has become very expensive and is becoming increasingly scarce.

The paper then turns to the consuming devices, comparing the performances of 6 and 12 V starter motors and the different types of pinion engaging mechanisms. The relatively large amount of power needed to start a comparatively small engine is commented upon.

There have been no great developments in ignition equipment, but the author points out that an improved system will need to be devised for engines of higher compression ratios which are impending.

In a brief reference to accessory devices, the paper mentions that the international standardization of direction indicators is now under consideration in nearly all countries. The author concludes by explaining that British manufacturers are unable to adopt anything like the all-glass sealed beam headlamp, general in the U.S.A., because they have to export a large proportion of their products to a number of overseas countries in which lighting requirements differ widely.

Electroplating Conference

THE twenty-fifth anniversary of the founding of the Electrodepositors' Technical Society will be celebrated at the Silver Jubilee Conference which is to take place from the 19th to the 22nd April at the Grand Hotel, Eastbourne.

Besides the presentation of technical papers, there will be general discussions on practical topics, including education in the plating industry, an official dinner and other social functions. The meeting will be open to members and non-members alike, further details being obtainable from the Secretary, 27, High Street, Islington, London, N.1.

Purchase Tax on Water Heaters

THE Treasury has made an Order under Section 21 of the Finance Act, 1948 (The Purchase Tax (No. 6) Order, 1949, Statutory Instruments 1949, No. 2453) the effect of which is:—

(a) to reduce the tax on thermal storage water heaters suitable for operation from electric mains from 100 per cent to 66⅔ per cent; and

(*b*) to exempt from tax instantaneous water heaters which are not suitable for operation from electric or gas mains.

The reduction at (*a*) applies only to water heaters of the "self-contained" type, i.e., the factory-made assembly comprising an insulated vessel, heater and thermostat complete in an outer case. The exemption at (*b*) applies only to instantaneous water heaters not operable from the mains, e.g., instantaneous heaters using "bottled," or calor, gas.

The position of instantaneous water heaters, immersion water heaters and circulator water heaters operable from electric or gas mains remains unchanged, i.e., the tax on electric immersion heaters (of less than 4 kW) and instantaneous water heaters remains at 100 per cent, and that on equivalent gas appliances at 66⅔ per cent.

The Order applies to appliances of the kinds specified which are delivered on sale, or appropriated to retail trade or similar purposes, on or after the 9th January, 1950, and to imported goods which are entered with the Customs for clearance on payment of tax, or which are delivered from bonded warehouse for home consumption on or after that date.

Water Turbine Design

DURING the last twenty years the Kaplan water turbine has, in several cases, ousted the Francis type. Several machines are now operating at heads of 100/150ft, and others are being built for up to 240ft heads. Designers are not now seeking to increase efficiency but are endeavouring to increase the size of individual machines and to raise their working heads. For both these purposes it is necessary to minimize water velocities locally in order to avoid cavitation. The problem is thus similar to that which confronts high-speed aircraft designers.

Accordingly, in a paper which has been prepared by Mr. S. P. Hutton (Chief Scientific Officer, Fluid Dynamics Division, Mechanical Engineering Research Organization, D.S.I.R.) for the Institution of Mechanical Engineers, the laminar flow aerofoil theory is explained and an endeavour made to apply analogous methods to the design of Kaplan turbine blades.

The author considers this method of design to be more logical than the purely trial and error conventional method. All the mathematical methods of designing aerofoil shapes, to ensure specific velocity distribution in cascade, are, however, laborious, but the Lighthill method (Aeronautical Research Committee, Reports and Memoranda No. 2104) is thought to be probably the best, in spite of needing skilled computers. The main difficulty at the moment is in choosing the velocity distribution which is likely to give the best working results.

So far as can be judged from published work, the agreement between experiment and theory is not very close; therefore until more systematic experimental work has been done it will remain impossible to decide which method of design is likely to be the more reliable. There is an urgent need, however, to make design methods as simple and rapid as possible. This paper suggests that the thin aerofoil theory might be developed for this purpose.

Christmas Lecture

FOR the fourth year in succession the Institution of Electrical Engineers has arranged a Christmas lecture for older school children, and on Wednesday and Thursday of last week the lecture theatre at the Institution Building in London was packed to capacity with a large and interested audience which had gathered to hear Mr. H. L. Kirke, head of the research department of the B.B.C., give an explanation of how television worked.

Mr. Kirke assumed that his audience had some elementary knowledge of electricity, and by means of a series of simple analogies he explained the basic working principles of a television system. Most of the lecture was taken up by a detailed consideration of the scanning process and this was followed by a discussion of the camera and cathode ray tube. The transmission of video signals by line and radio was then explained and, in conclusion, Mr. Kirke outlined some of the possible future developments in the field of high definition transmission and colour television.

The lecture was delivered in a clear, concise and friendly manner and, aided by the excellent demonstrations which were given, there is no doubt that most of the children who attended went away with some idea of what television was all about.

Commerce and Industry

The "Mellow" Fluorescent Lamp

Henley's New Factory

AS mentioned in our article on the Lighting Service Bureau last week, electric lamp manufacturers have introduced the "Mellow" fluorescent lamp intended for situations where a really warm colour is required. Flattering to human complexions and making furnishings, fabrics and foodstuffs look especially attractive, the new lamp is particularly suited to the lighting of restaurants, lounges, shops, etc. At present it is available in the 5ft 80 W size only. The standard lamp costs 15s 6d, plus 4s purchase tax, while the lamp for use with instant start gear costs 16s 6d, plus 4s 3d purchase tax.

Hopkinson-Brush Arrangement

Arrangements have now been completed whereby the Brush Electrical Engineering Co., Ltd., has assumed control of the Hopkinson Electric Co., Ltd. In a statement Mr. J. Adamson, formerly receiver of the Hopkinson Electric Co., Ltd., says that it is part of these arrangements that prereceivership creditors of the Hopkinson Co., for sums up to £500 shall be paid in full immediately, and that creditors for sums in excess of that figure shall be paid over a period. He understands that arrangements will be put in hand immediately for payment on these terms. Mr. Adamson's receivership terminated as at 29th December, 1949. All liabilities incurred by him as receiver to 29th December will be paid in full on their due dates, and all such creditors should forward their accounts to Mr. Adamson, c/o Hopkinson Electric Co., Ltd., Birchgrove, Cardiff, as soon as possible.

Darkness into Daylight

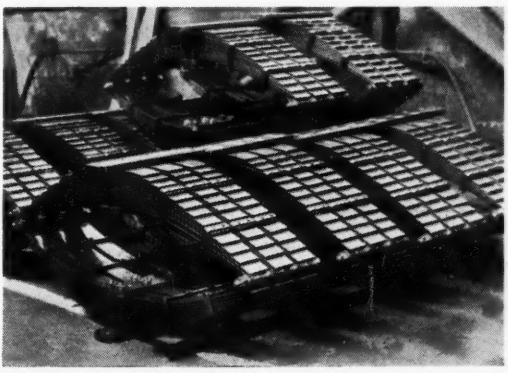
A demonstration and lecture entitled "Darkness into Daylight," by Dr. J. N. Aldington, will be given on 26th January at the Philharmonic Hall, Liverpool, under the auspices of the Merseyside Electric Lighting Service Committee. The lecture will be open to the public and admission (by ticket only) will be free. Tickets can be obtained from the hon. secretary of the Committee, Mr. K. R. Mackley, Inner Temple, 24, Dale Street, Liverpool, 2. The Merseyside Electric Lighting Service Committee represents the Merseyside and North Wales Electricity Board, the Electrical Contractors' Association, the Illuminating Engineering Society, the Lighting Service Bureau Local Advisory Committee, and local electrical wholesalers.

Meter Agreement

British Insulated Callender's Cables, Ltd., and Ferranti, Ltd., announce that an arrangement is now in force whereby their respective meter design and technical staffs are working in close collaboration.

Synchrotron Foundation

Weighing 120 tons, the synchrotron being built into an underground concrete-lined chamber at the Glasgow University will be supported on an eight-ton "spring mattress" consisting of twenty nests of 14-leaf springs similar to those used in heavy transport vehicles. Each nest contains three full elliptical springs of 84 leaves approximately 6ft long. They have been designed and built by William E. Cary, Ltd., vehicle spring manufacturers, of Red Bank, Manchester, at the request of the Metropolitan-Vickers Electrical Co., Ltd. (which is making the synchrotron) to provide a foun-



Nests of leaf springs to form a "mattress" foundation for a synchrotron at Glasgow University

dation that is intended to reduce shock and vibration. A special underground chamber is being constructed at the rear of the Glasgow University to house the synchroton.

Television Display

A special display has been arranged by the General Electric Co., Ltd., at the Science Museum, Kensington, London, illustrating the essential features of the London-Birmingham television link which was designed, built and installed by the company to the specification of the Post Office. The display is shown in the accompanying picture.

G.E.C. television exhibit at the Science Museum, Kensington

New Henley Works

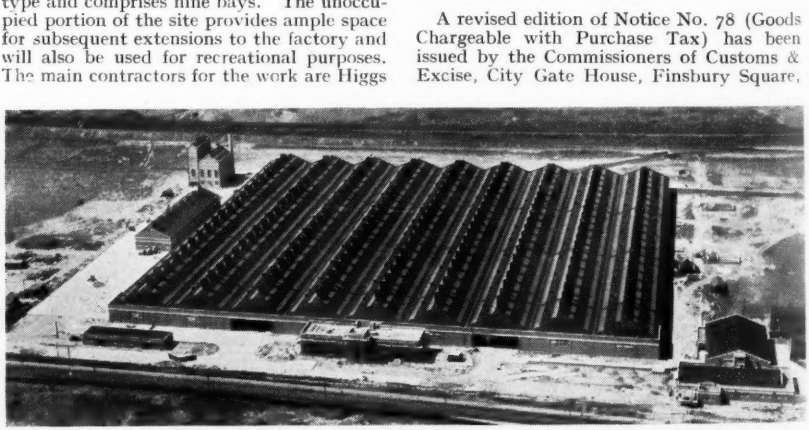
The new factory of W.T. Henley's Telegraph Works, Co., Ltd., situated at Birtley, Co. Durham, is nearing completion. The site extends from the main Durham-Newcastle road to the British Railways main line, London to Newcastle and the North, an area of about 45 acres.

The main factory building covers a floor area of approximately nine acres, and in addition there are various ancillary buildings including the boilerhouse, maintenance and repair shops, canteen and dining hall, and welfare department. An administrative block stands centrally in front of the factory buildings and faces the main road. The main factory building is of the single-storey type and comprises nine bays. The unoccupied portion of the site provides ample space for subsequent extensions to the factory and will also be used for recreational purposes. The main contractors for the work are Higgs & Hill, Ltd., and the architects are Waterhouse & Ripley, of London.

The factory, which will be engaged on the production of electric wires and cables, principally of the rubber insulated types, is additional to the factory at Birtley taken over in 1945, which has been in continuous production within the limits of the plant, etc., available. The works manager for North Woolwich and Birtley is Mr. A. W. McArthur and the assistant works manager for Birtley is Mr. A. T. Winder.

Purchase Tax Notice

A revised edition of Notice No. 78 (Goods Chargeable with Purchase Tax) has been issued by the Commissioners of Customs & Excise, City Gate House, Finsbury Square,



An aerial view of the new factory of W. T. Henley's Telegraph Works Co. in course of construction

London, E.C.2. This supersedes the September, 1948, edition and all additions and amendments thereto published up to 31st October last.

Atlas-Ekco Agreement

E. K. Cole, Ltd., and Ekco-Ensign Electric, Ltd., have concluded an agreement with Thorn Electrical Industries, Ltd., which will result in close technical and manufacturing co-operation in the electric lamp and lighting fields. This arrangement will entail the use of large-scale manufacturing techniques new to this country and will enable the companies to increase efficiency, reduce costs and compete more favourably, particularly in export markets. The advantages of the close association and technical co-operation between the Atlas Lighting Division of Thorn Electrical Industries and Sylvania Electric Products, Inc., U.S.A., will be fully available to Ekco-Ensign. The independent sales policies of Atlas and Ekco-Ensign remain unchanged.

Anglo-American Production Study

The Anglo-American Council on Productivity has sent us some notes on the tour of the Productivity Team headed by Mr. J. R. Walton (Electrical Apparatus Co., Ltd.) which has been studying the production of electrical starting and control gear in the United States. The members have come to the conclusion that among the reasons why American craftsmen are willing to work at high speed in order to attain maximum production are that their wages buy more, their diet is much more varied and they have more mechanical aids.

Mr. Walton stated at one meeting that he believed that in a good many lines British craftsmanship was superior to the American and that the British worked just as hard as the Americans, to the limit of their strength.

The team found that the electrical industry in the United States had an overwhelming proportion of male employees, many doing work that was generally regarded as women's province in the United Kingdom. The fact that men and women were paid almost identical wages in American industry was held to explain this fact, Mr. Walton said. As a rule the difference between male and female labour wages in American industry was not more than 10 per cent on like jobs.

The members of the team were due to leave the United States yesterday (Thursday) in the *Queen Mary*.

Birmingham Television Exhibition

The Radio Industry Council announces that a radio exhibition, with television as the main feature, is to be held at Castle Bromwich, Birmingham, in September next; the exact date of the exhibition will be announced later.

Wholesalers' Annual Dinner

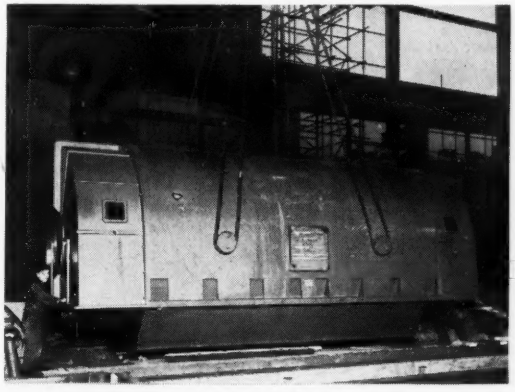
The annual dinner of the Electrical Wholesalers' Federation is to be held at the Savoy Hotel, London, on 23rd March.

Electricity Supply Statutes

A revised edition of "The Electricity Supply Statutes as adapted or modified by the Electricity Act, 1947," by J. W. Simpson, O.B.E., and C. J. Hornsby, will shortly be available. We are informed that this work has been recommended to students for use in connection with the examination courses of certain professional bodies and the price to "recognized students" is 12s 6d (15s to others). Copies will be obtainable from Mr. Simpson at 16, Stratford Place, London, W.1.

Plant for Agecroft Station

In the accompanying picture we show the arrival on site on 3rd January of the stator for the second of the two turbo-generators being installed in the Agecroft power station of the N.W. Division of the British Electricity Authority. The new station will contain two Metrovick 52,500 kW turbo sets each consisting of a 50,000 kW main generator and a 2,500 kW house service generator.



Stator of first 50,000 kW turbo-generator arriving at the new Agecroft power station

Telephone Equipment for Export

The General Electric Co., Ltd., has recently received orders from distant parts of the world for telephone equipment to the value of £250,000. The Australian Post Office has placed an order for an automatic telephone exchange to serve 4,200 subscribers at Kooyong. An order received from the New Zealand Post Office is for an automatic telephone exchange at Palmerston North for 2,100 subscribers. All the equipment for these orders will be manufactured in the Coventry Telephone Works of the G.E.C.

Diesel Engine Agreement

Richardsons, Westgarth & Co., Ltd., and Sulzer Bros. (London), Ltd., announce that an agreement has been concluded between them under which Richardsons, Westgarth & Co., Ltd., will manufacture Sulzer engines for land installations at the works in Sunderland of their associated company George Clark (1938), Ltd. Under the agreement all questions of sales and co-ordination of design of the plant will be handled by Sulzer Bros. (London), Ltd. George Clark (1938), Ltd., have already manufactured marine diesel engines of Sulzer design. Inquiries should be addressed to Sulzer Bros. (London), Ltd., 31, Bedford Square, London, W.C.1.

Trade Announcements

Standard Telephones & Cables, Ltd. (Newport Cables Division), announces the opening on 23rd January, of a new branch office and depot at 7-9, Tempest Hey, Liverpool, 2 (telephone: Central 0756). The branch will be under the management of Mr. A. D. Fairless.

The Manchester office of the **Simplex Electric Co., Ltd.,** is now 1, Union Street, Manchester, 4 (telephone: Deansgate 6511).

The Special Lamps Department of **Philips Electrical, Ltd.,** has recently announced that "Photoflux" flashbulbs, types PF14, PF25 and PF56, are again available.

Mr. A. Duke, who is well known in the Birmingham area where he spent ten years as a lamp representative and sales engineer, has joined the Atlas lamp sales organization of **Thorn Electrical Industries, Ltd.** Mr. D. Scott has joined the company as lamp sales representative for the Salisbury, Southampton, Bournemouth and Dorset area. Mr. Scott previously represented Wm. Dibben & Sons, Ltd., of Bournemouth.

Thomas Duncan, Ltd., electrical factors and distributors, have moved to new premises at 135, East Road, London, E.C.1 (telephone: London Wall 0396) with improved office and storerooms. Facilities are available for assisting contractors in preparing estimates and designs for heating and lighting schemes, etc.

Industrial Film Making

The British Engineers' Association and the British Electrical and Allied Manufacturers' Association have published, jointly, a "Guide to Industrial Film Making." This booklet was prepared by the Joint Publicity Committee of the two Associations to aid manufacturers in assessing beforehand the factors affecting the costs of producing films and the supplementary charges likely to arise therefrom. Manufacturers are increasingly using specially produced films as sales-aids, for the instruction of maintenance men and service staffs, or for a wide variety of other purposes. It is therefore felt that this guide will satisfy a long-felt want, as it not only provides comprehensive information concerning production but also includes particulars on distribution, technical film terms, etc. Copies can be obtained (price 2s each, post free) from either the British Engineers' Association, 32, Victoria Street, London, S.W.1, or the British Electrical & Allied Manufacturers' Association, 36 and 38, Kingsway, London, W.C.2.

Hire Purchase and Credit Sales

The Board of Trade, after consultation with the Central Price Regulation Committee, has made the Hire-Purchase and Credit Sale Agreements (Maximum Prices and Charges) Order, 1950, which supersedes all earlier Orders controlling hire-purchase and credit charges from 23rd January. Except for a few items, the new Order applies to all price-controlled goods. It repeats the existing provisions for "short-term" credit sales, with one addition. In order to take advantage of the 5 per cent allowance the agreement must be confined to goods to which the Order applies. This amendment is in keeping with the corresponding requirement for hire-purchase and long-term credit transactions.

Derby Schools Contracts

At a meeting of the Derby Corporation protests were raised against the Education Committee's proposal that contracts worth £7,500 for electrical installations in Derby schools should be awarded to the East Midlands Electricity Board. Councillor A. Ling said that the work was apparently to be carried out by the Board without tender, and he asked that competitive tenders should be obtained in future when sums of that magnitude were involved. Councillor H. J. T. Russell, vice-chairman of the Education Committee, said that alternative tenders had not been asked for

because it was the policy of the Council that the East Midlands Electricity Board should continue to give them the same service as when the electricity service was under Corporation control. The Committee's recommendation was carried.

Trade with Japan

The Board of Trade has made three Orders under the Trading with the Enemy Act, 1939, the general effect of which is that so far as Trading with the Enemy legislation is concerned persons in the United Kingdom are now free to engage in trade with persons and concerns in Japan, including the remittance of money, in the same way as they may trade with any other country. This is subject to any conditions or restrictions, general or particular, imposed under any other Act or Regulation which may be applicable in respect of any transaction contemplated.

Fusible Alloys

A 24-page illustrated booklet, which is available free of charge to all interested persons from the Tin Research Institute, Fraser Road, Greenford, Middlesex, describes the composition and properties of the tin-containing fusible alloys and outlines some of their more important industrial applications. Apart from discussing the use of these alloys in safety devices, foundry patterns, moulds for thermo-plastics, dentistry and so on, the booklet shows how this range of materials is employed in aircraft assembly jigs and in press tools.

Production in 1949

Chancellor's Review

AT a Press conference held in London last Monday Sir Stafford Cripps, reviewing economic developments in 1949, said that the rise in industrial output continued rapidly with the result that our economic position had been basically strengthened.

He said that in each of the first three quarters of the past year and at the beginning of the fourth quarter the index of industrial production was about 8 points above the corresponding period of 1948. Making allowance for a small increase in labour forces, this indicated a rise in productivity or in output per man-year of about 5 per cent. The average level of industrial production for first eleven months of 1949 was estimated provisionally at 128-129 as compared with the first eleven months of 1948, and if this was so then the output for the year should be approaching 30 per cent above the pre-war level.

Among manufactures, the increase in metals, engineering and vehicles, which together accounted for half the total output, was 7 per cent. In 1949 a third of the increased output of goods came from metal-using industries. During the same year the steel industry produced just over the maximum target which had been set by the Economic Survey.

Referring to the need for avoiding inflation, Sir Stafford said one of the principal factors in the comparative price stability had been the personal restraint exercised voluntarily by the people of this country. Over the nine months, March-November, 1949, about 90 per cent of the industrial companies (measured by reference to issued capital) had paid dividends no higher than those distributed in the preceding year.

With regard to exports, the volume had been raised to a level half as high again as in 1938 and the increase was about 10 per cent over 1948. Of our exports in 1949 about half went to the rest of the sterling area, one-quarter to Western Europe and one-tenth to the dollar area. The provisional estimate for our total exports in 1949 was £1,785 million and for re-exports £59 million. The provisional import total for the year was £2,273 million as compared with £2,078 million in 1948.

TRADE MARKS

APPLICATIONS have been made for the registrations of the following trade marks. Objections may be entered within a month of 4th January:—

HEXA (design). No. 656,834. Class 9. Neon advertising signs, electric transformers, and electric battery chargers.—F. C. Hill & Co., Ltd., 17, Bilston Street, Wolverhampton.

HYCAP. No. 670,912. Class 9. Electric storage batteries and parts thereof and fittings therefore, all included in Class 9.—The Electric Storage Battery Co., Philadelphia, Penn., U.S.A. Address for service c/o Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

VITAMIN Q. No. 676,937. Class 9. Electrical condensers.—Sprague Electric Co., Inc., North Adams, Massachusetts, U.S.A. Address for service c/o Page, White & Farrer, 27, Chancery Lane, London, W.C.2.

VENT-AXIA (design). No. 666,257. Class 11. Ventilating fans and self-contained electric fan ventilators. — Vent-Axia, Ltd., 116, Putney Bridge Road, London, S.W.15.

MULLARD. No. B669,339. Class 11. Heating apparatus and parts thereof and fittings therefor, all included in Class 11; cooking, refrigerating, drying, ventilating, air-conditioning and lighting installations and apparatus, parts and fittings all included in Class 11; electric lamps included in Class 11 for use in photography; electric torches; and filters included in Class 11.—Mullard Electronic Products, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

Power Export

Norway to Denmark Transmission Scheme

FOR some time past technicians from Norway, Denmark and Sweden have been discussing the possibilities of transmitting electricity from Norway to Denmark. Just before Christmas details of the scheme were issued in the form of a report on the project. The scheme envisages the transmission of some 600 million kWh from Norway to Denmark each year, about half as much again as the present consumption in Copenhagen. There would be a constant 40,000 kW, or 240 million kWh a year, while in the summer there would be an addition of surplus electricity which would bring the annual total to about 600 million kWh.

Cable Route

At present, however, Norway herself needs all the power that can be generated and it is proposed that additional generators should be installed in existing stations —two at Aura, one at Norell and three at Solbergfoss, and it will also be necessary to install additional cables. The power would be transmitted from Norway via Sweden to a point north of Helsingborg and then by submarine cable under Oresund to Sjaelland, whence it would be carried on to Copenhagen. The total cost of the installation is estimated at £8,300,000, of which £5 million would be spent on the Norwegian end of the scheme, £2,500,000 in Sweden and only £600,000 in Denmark itself. Imports from hard currency areas of necessary equipment would amount to the equivalent of £450,000.

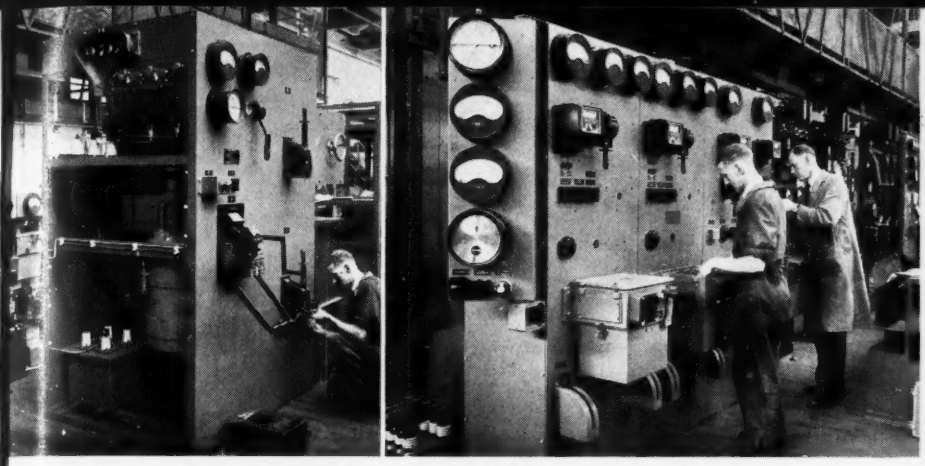
It is proposed that the cost of the installations in Norway should be covered by a 3 per cent loan from the Danish to the Norwegian Government and, in addition, it is assumed that the project can be financed from Marshall Aid sources up to about 10 million dollars. Apart from financial aid from Denmark, it would also be necessary for some 200 or 250 skilled engineers to work in Norway for up to four years. Sweden would assist by laying the cables across her territory and from the frontier to Ulven, in Norway. Denmark would pay an average of 2.2 öre per kWh (about a farthing) for the energy delivered from Ulven. The whole project, it is suggested, should be completed by the end of 1954 and the electricity would be supplied under a 25-year contract.

Commenting on the scheme, Mr. Lars Evensen, the Norwegian Minister of Industry, said that it must be considered in close relation with the negotiations going on between the three Scandinavian countries regarding economic co-operation. Although Sweden was only indirectly interested in the scheme, the Swedish electrical authorities had done much to make it feasible: the existing cable network in Sweden was already overloaded, and it would be necessary to install all the cables needed for the new scheme.

Marshall Aid Proviso

In recommending the scheme, the experts from the three countries stipulate that there should be a special allocation of Marshall Aid dollars to make it possible. The proposals now have to be considered by the Governments, the electricity authorities and members of parliament in the three countries. It is expected that the main objection will be from those who consider that power generated in Norway could best be used inside the country rather than be sold to Denmark. However, it is not proposed that the new scheme should interfere with the existing expansion schemes in hand by the Norwegian authorities, so there is no question of curtailing home supplies for the hypothetical exports.

This year Norway expects to produce about 15,000 million kWh, or 4,700 kWh per inhabitant. Sweden produces about 2,800 kWh per inhabitant and Denmark only 485.



An Erskine, Heap 1,000 h.p. auto-transformer starter which has been produced for an Australian paper mill and (right) switchboard nearing completion for the Sokoto power station, Nigeria

Switchgear Development

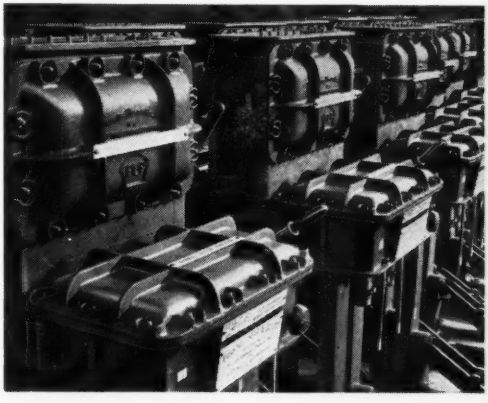
"MAKING" AGAINST HIGH PEAK CURRENTS

AMONG a number of recent developments by Erskine, Heap & Co., Ltd., is a contact specially designed to meet the onerous duty of "making" against high peak currents, by using the full surface contact, under pressure, of both the main and arcing contacts at the instant of making circuit, while ensuring that the breaking of the circuit is made on the tips of the arcing contacts only.

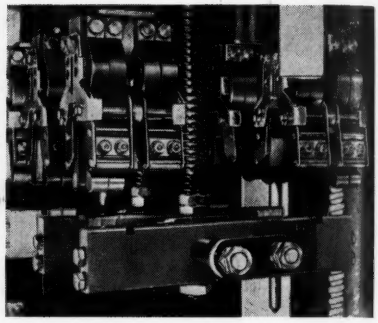
The fixed finger contacts, which are individually self-aligning, are mounted on pivoted side plates, and when the oil circuit breaker is "off" they are held in an open vee position. The moving contact is parallel sided and during the "making" operation it passes between the open vee without touching the fixed contacts, pressing upwards an insulated slider block which forces the finger contacts to close on to the sides of the moving contact bar with full surface contact. After contact is made a further movement of the moving contact bar gives a wiping action to the contact surfaces and increases the contact pressure. Thus full surface contact under pressure is obtained at the instant of "make" on both the main and the arcing contacts, which enables the circuit breaker to make against much higher peak currents than would be the case if only the arcing contacts touched first.

During the breaking operation the slider holds the finger contacts parallel until the moving contact leaves the bottom tips of the arcing contacts and at this instant the slider, which is spring

A works photograph of part of an order for 500 flameproof direct-on starters for Russia



An assembly of Type "MB" switchgear showing (below) the contact mechanism



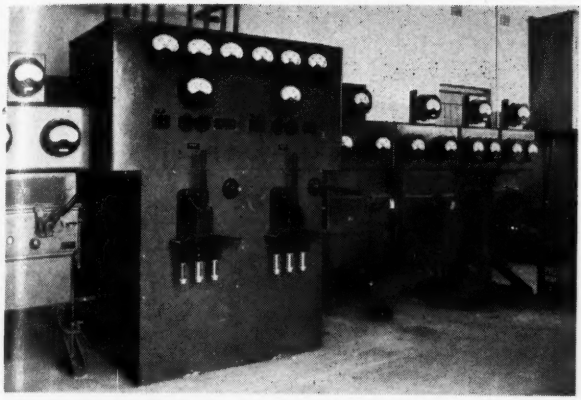
controlled, forces the contacts out into their free position; thus the effective speed of break is considerably higher than the speed of the moving contact bar. It should be mentioned that the main contacts are shorter than the arcing contacts and as a consequence there is a considerable lead, on breaking operations, between the arcing tip and the main contacts, so ensuring that all arcing is confined to the tips of the arcing contacts only.

A new range of type "MB" oil circuit breakers and type "MBV" metalclad units incorporating this contact has been developed and these have been successfully short-circuit tested and ASTA certified for 25 MVA at 400 V and 50 MVA at 3.3 kV, both in accordance with BS 116-1937. In addition, successful make-and-break tests have been made at 75 MVA 3.3 kV. These breakers and units are available at current ratings of 600, 800, 1,000 and 1,200 A for the l.v. range and 400, 600 and 800 A for the 3.3 kV range.

Short-circuit tests for 25 MVA at 400 V to BS 116-1937 require the oil circuit breaker to close against 92 peak kA and break 36 kA r.m.s. The type "MB" oil circuit breaker has successfully closed against peak-making currents in excess of of 100 kA and successfully cleared r.m.s. fault currents in excess of 40 kA at 440 V, clearly demonstrating that the circuit breaker is capable of making and breaking higher values than its certified 25 MVA rating and proving the high efficiency of its contact system. The maximum arc duration on the 100 per cent break tests was 2.9 loops on the 25 MVA 400 V tests and 3 loops on the 50 MVA 3.3 kV tests.

In designing these circuit breakers and units every effort has been made to keep down production costs without sacrificing quality, pressed parts being employed wherever possible. The breakers and units are available with hand, spring, or solenoid operation. The hand-operating

"R.S. 5" combined stator and rotor starter for non-reversing constant speed slip-ring motor being assembled. Many of these starters are on order for South Africa and India



This nine-unit totally enclosed 380/220 V switchboard has already been installed at the new biscuit factory of Pyott, Ltd., Port Elizabeth, South Africa

mechanism can be converted for spring or solenoid operation by simply adding the spring mechanism or solenoid as required. Our illustrations show the "off" position of the contact system on the type "MB" oil circuit breaker, and a 4-panel type "MBV" metalclad switchboard with hand-operated oil circuit breakers.

Although these switches have only recently been placed on the market orders are already coming in from overseas and when we visited the factory units were in hand for the South African Railways (solenoid operated) and a paint factory (hand operated) also in South Africa, as well as large contracts for Government Departments for use at home and abroad, and also several big textile mill contracts. Over 70 per cent of the production is going abroad nowadays. Russia is a particularly good customer and an order was in hand for 500 flameproof direct-on starters, thirty-seven switchboards being due for delivery next year.

Another interesting order nearing completion was a 1,000 h.p. auto-transformer starter for an Australian paper mill. Employing the Korndorffer system, it is designed to give a completely smooth start. Loom switches were being made in large quantities for the textile industry both in this country and overseas.

EPICYCLIC GEARING

THE announcement of an agreement under which W. H. Allen, Sons & Co., Ltd., are now manufacturing epicyclic gears at Bedford in accordance with the principles laid down by Mr. W. G. Stoeckicht, of Munich, is a reminder of the way in which the design of gearing for industrial and marine uses, as opposed to highly stressed aircraft gears, has quietly changed in Germany during the last twenty years.

The extent to which this development has progressed may be judged from the fact that the 1,150 h.p., 1,060/5,035 r.p.m., planetary gears of the boiler feed pumps in the Mannheim power station are of approximately one-tenth the weight and volume of conventional gearing for the same duty—and cost appreciably less.

The company has orders for two steam turbo-alternators for industrial installations which will be fitted with epicyclic gears of its own design and manufacture, as will also the gas turbine generator of 1,000 kW (*Electrical Review*, 11th November, 1949) being constructed for the Admiralty.

For marine auxiliary plant this type of gearing results in a marked saving of space and weight when used in conjunction with back pressure turbo-generators.

There is an article on the subject in the January issue of the *Allen Engineering Review*, as well as a description by Mr. R. J. B. Keig (Royal Naval Scientific Service) of the testing of epicyclic gears with strain gauges.

The company has also examined, in conjunction with Mr. Stoeckicht, the possibilities of both straightforward and reverse reduction epicyclic gears for main propulsion purposes. In the case of the 7,500 h.p., 4,500/116 r.p.m. set investigated, the largest gear wheel would be an annulus ring of about 42in pitch circle diameter. Since, however, Allen, Sons & Co. specialize in the design and construction of ships' auxiliary machinery, they do not themselves propose to compete in the manufacture of main propulsion gears, but are considering ways and means of working with firms which may be interested.

NEXT WEEK'S EVENTS

Monday, 16th January

BIRMINGHAM.—Birmingham Electric Club. "The Cavendish Laboratory and some of its Radio Work." By A. J. Ratcliffe.

CARDIFF.—South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. "The Performance of the British Grid System in Thunderstorms," by Dr. J. S. Forrest.

LIVERPOOL.—Liverpool Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Technical Considerations Affecting the Development and Design of Electrical Control Gear for Machine Tools" by A. R. H. Thorne.

LONDON.—Savoy Place London W.C.2 5.30 p.m. Institution of Electrical Engineers. Informal Meeting. Discussion on "Discussions" to be opened by C. O. Boys.

St. Ermins Hotel S.W.1 6.50 p.m. A.S.E.E. Central London Branch. "Paper Insulated Cables" by H. E. Tickner.

NEWCASTLE-ON-TYNE.—King's College 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Lecture on "Some Electro-Magnetic Problems" by Prof. G. W. O. Howe.

STOCKPORT.—White Lion Hotel, Underbank, 8 p.m. A.S.E.E. Stockport Branch. "Resistance Welding."

Tuesday, 17th January

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "The Application of Differential Analysers with Electrolytic Tanks for Tracing Electron Trajectories," by K. F. Sander.

LONDON.—Savoy Place, London, W.C.2, 5.30 p.m. I.E.E. Measurements Section. "Factors Influencing the Design of a Rubber Model," by G. B. Walker. Other demonstrations of apparatus for solving the Laplace equation by E. Colin Cherry and E. E. Hutchings (joint meeting with the Radio Section).

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "The Electrical Equipment of a Modern Film Studio," by H. Clifton.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 5.30 p.m. Institute of Fuel. Three papers on "Downjet Coke Firing."

Wednesday, 18th January

BRIGHTON.—Technical College, 6.30 p.m. I.E.E. Southern Centre. "The Performance of the British Grid System in Thunderstorms," by Dr. J. S. Forrest.

COVENTRY.—At the G.E.C. Telephone Works, 7.30 p.m. I.E.E. South Midland Students' Section. "Insulation, a Practical Treatise," by R. E. R. Crick.

The Butts, 7 p.m. A.S.E.E. Coventry Branch. "Electronics in Industry," by L. G. Ward.

LONDON.—Central Hall, Westminster, S.W.1, 6.30 p.m. Institution of Electrical Engineers. Faraday Lecture on "Radar," by Dr. R. A. Smith.

I.E.E. London Students' Section, 9.30 p.m. Visit to Associated Newspapers, Ltd., E.C.4.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. "Some Considerations in the Design of Negative-Feedback Amplifiers," by W. T. Duerdoth.

SHEFFIELD.—Grand Hotel, 6.15 p.m. I.E.E. Sheffield Sub-Centre. Film on "Atomic Physics."

SWANSEA.—The Y.M.C.A., 6 p.m. Illuminating Engineering Society, Swansea Group. "Industrial Lighting," by M. W. Peirce.

Thursday, 19th January

BIRMINGHAM.—Botanical Gardens, Edgbaston, 6.30 for 7 p.m. Electrodepositors' Technical Society, Midlands Centre. Dinner dance.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. Lecture on "Some Aspects of Agricultural and Horticultural Electrification in North America," by F. E. Rowland.

LONDON.—Caxton Hall, Westminster, S.W.1, 2.30 p.m. Diesel Engine Users' Association. "Fuel Injection in Modern Oil Engines," by W. A. Green.

At the London School of Hygiene and Tropical Medicine, W.C.1, 6.30 p.m. British Institution of Radio Engineers. "The Performance and Stability of Permanent Magnets," by A. J. Tyrrell.

RUGBY.—Electricity Showrooms, 6.30 p.m. I.E.E. Rugby Sub-Centre. The Students' Lecture: "Patents and the Electrical Engineer," by L. H. A. Carr.

WOLVERHAMPTON.—Midlands Electricity Board Service Centre, Darlington Street, 7 p.m. E.P.E.A. Midland Technical Group. "Power Stations, Past and Present," by F. W. Lawton.

Friday, 20th January

COVENTRY.—Daimler Ballroom, Brown's Lane. Coventry Electric Club. Dinner and dance.

LONDON.—I.E.E. London Students' Section, 9.30 p.m. Visit to Associated Newspapers, Ltd., E.C.4. (Repeat visit.)

SOUTHAMPTON.—Guildhall, 6.30 p.m. I.E.E. Southern Centre. Faraday Lecture on "Radar," by Dr. R. A. Smith.

I.E.E. Centre Dinners

THE Western Centre of the Institution of Electrical Engineers is holding a dinner dance on 17th February at the Grand Spa Hotel, Clifton, Bristol. Tickets (£1 1s each) can be obtained from Mr. A. H. McQueen, hon. assistant secretary, 15, Great George Street, Bristol. Students and graduates may attend the dance only (tickets 6s 6d each).

The Scottish Centre of the Institution is also holding a dinner dance on 8th February at the Grosvenor Restaurant, Gordon Street, Glasgow. Applications for tickets (30s each) should be made to Mr. C. S. Buyers, hon. secretary of the Centre, 164, Bothwell Street, Glasgow, C.2. Students and graduates can obtain tickets for a buffet dance only at 10s each.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

REPORTS AND DIVIDENDS

Turner & Newall, Ltd.—The annual general meeting will be held on 26th January, when it is expected that Mr. W. W. F. Shepherd (chairman) will preside. In his statement which has been circulated, Mr. Shepherd reviews the company's operations during the year ended 30th September last, both at home and abroad. Mention is made in particular of the increased production at the Rochdale factory of Turner Brothers Asbestos Co., Ltd., and the fact that that company's new factory at Hindley Green is now in production.

Hilger & Watts, Ltd., report an approximate profit for the year to 30th September last of £39,000, as compared with £14,204 for the preceding seven months. The ordinary dividend for the year is 7½ per cent (against 3½ per cent for seven months).

Hackbridge Cable Holdings, Ltd., has declared an interim dividend of 7½ per cent.

Morphy-Richards, Ltd.—At an extraordinary meeting held recently approval was given to the distribution of a 300 per cent capital bonus to ordinary stockholders.

NEW COMPANIES

Brook Motors (Holdings), Ltd.—Registered 31st December. Capital £100. To acquire the whole or any part of the issued shares of Brook Motors, Ltd., and to carry on the business of electrical engineers, manufacturing electricians, manufacturers of and dealers in electric motors, etc. Subscribers: F. V. Brook and J. L. Brook. Regd. office: Empress Works, Huddersfield.

M. S. Webb & Sons, Ltd.—Registered 4th January. Capital £1,000. Electrical engineers and contractors, etc. Directors: M. S. Webb, R. M. Webb and A. W. Cox. Regd. office: 196, High Street, Bromley, Kent.

William Clancy & Co. (Electrical Engineers), Ltd.—Registered in Edinburgh 29th December. Capital £500. Wm. Clancy is the first director. Regd. office: 141, Bath Street, Glasgow, C.2.

Machine & Electrical Projects, Ltd.—Registered 19th December. Capital £500. Directors: G. S. Bell, P. R. O. Marden and J. Gillies. Regd. office: 39, Victoria Street, S.W.1.

Fred Stones & Son, Ltd.—Registered 21st December. Capital £1,000. Electricians, electrical and wiring contractors, etc. Directors: F. Stones and W. Stones. Regd. office: 2, St. Andrews Road South, St. Annes-on-Sea, Lytham St. Annes.

Hainsworth Laycock, Ltd.—Registered 31st December. Capital £3,000. Electrical and wireless engineers and general electrical installation contractors, etc. Directors: W. H. Laycock, Florence Laycock, and E. V. Laycock. Regd. office: 20-22, Imperial Arcade, Huddersfield.

Gaish & Burge, Ltd.—Registered 17th December. Capital £1,500. Electricians, radio and electrical engineers, etc. Directors: E. H. Gaish, R. J. Burge and G. A. Smith. Regd. office: 2, Bank Buildings, Cranleigh, Surrey.

INCREASES OF CAPITAL

Allen West & Co., Ltd.—Increased by £550,000, in 5s ordinary shares, beyond the registered capital of £700,000.

Watliff Co., Ltd.—Increased by £87,000 in £1 "A" ordinary shares, beyond the registered capital of £21,000.

WINDING-UP PETITION

Electrical Fittings Co., Ltd.—A petition for the winding up of this company has been presented to the High Court by Enfield Cables, Ltd., and will be heard in London on 16th January.

LIQUIDATIONS

Stanley Cooper, Ltd.—Winding up voluntarily. Liquidator, Mr. B. M. Paton, 84, Union Street, Torquay, Devon.

Winterbottom & Walshaw, Ltd.—Winding up voluntarily. Liquidator, Mr. J. A. Hick, Wesley Chambers, Union Street, Dewsbury.

BANKRUPTCIES

A. Coates, formerly carrying on business in co-partnership with another under the name or style of Electro Radio, at 44, High Street, Buxton, radio and electrical contractor.—Receiving order made 3rd January on debtor's own petition.

FINANCIAL SECTION

STOCKS and SHARES

THE volume of Stock Exchange business continues to contract, accumulatively, as the General Election approaches. Business in most directions, outside the House as well as within it, is always slowed down by an appeal to the country and this time the greater uncertainty is doing more to impede enterprise and activity. Gilt-edged prices in the Stock Exchange are very depressed under the lead of British Government securities. Industrials keep tolerably steady in spite of the fact that there is not much evidence of willingness either to invest or to speculate.

English Electric Company

This company ends its financial year with the calendar, and is, as a rule, among the first in the field with its dividend and accounts. Last year, the final payment and preliminary figures were declared before the end of February. Meanwhile the company's name has been in the news under several headings. Entry into the field of domestic television receivers, in conjunction with the subsidiary, Marconi's Wireless Telegraph, was announced a few weeks ago. At the end of December there appeared a report from New York that both English Electric and Ferrantis had under-bid American manufacturers in tendering for the supply of equipment for the Seattle municipal power plant. Contracts have apparently not yet been awarded, but the event was regarded as a significant development from sterling's devaluation. Finally, there has been news of a new financing programme. The price of the shares holds its recent rise to 43s 6d.

Electrical Equipment Shares

Crompton Parkinson 5s "A" shares are quoted at 11s 9d ex-rights to the 100 per cent capital bonus; the new shares stand a fraction higher, by virtue of being transferable free of stamp in the form of allotment letters. No change is intended by the company in its profits distribution policy. On the consequent assumption that the last rate of dividend at 22½ per cent will be halved, the yield on the shares is £4 13s 9d per cent. Aberdare Cables ordinary are available at 54s, and show a yield of about 5½ per cent on the last year's 15 per cent distribution. The company raised conjecture by increasing the latest interim dividend from 6 to 12½ per cent; the final is due in March. Among the less active electrical issues, Peto Scott 2s shares are mentioned at 3s to yield 5 per cent on the dividend, reduced last year from 12½ to 7½ per cent. Thorn Electrics are offered at 18s 9d to pay 5½ per cent.

Price Changes

Improvements of about 6d have occurred in British Insulated Callender's, 31s 6d, Electrical Components, 11s 3d, Hall, 13s 6d, Pye, 32s, and Telephone Manufacturing, 9s. Globe Telegraph ordinary rose a florin to 42s in sympathy with a rise of 7½ in Cable & Wireless. Falls range mostly from 3d to 1s. E.M.I. 17s, General Electrics 74s 6d, and London Electrics 43s, show falls of 1s. Greenwood & Batley, 38s 9d, are 1/16 up. Radio Rentals are better at 27s 6d, ex the dividend which made 25 per cent for the year. The report showing that earnings, out of which the 25 per cent dividend is paid, came to over 100 per cent, stimulated interest in the shares. The company is about to issue 100,000 5s ordinary shares at 10s. E. K. Cole keep steady at 17s 6d on the announcement that an agreement has been concluded with Thorn Electrical Industries for co-operation in electric lamp manufacture.

"Dividend Postponed"

In the monthly table of prices given in last week's number, two asterisks inadvertently crept in. One of these appeared against the price for Chloride Electrical Storage, the other against Telegraph Construction. The asterisk, which referred to the note "dividend postponed," at the bottom of the page, certainly had no application to either of these two companies. The idea of their postponing dividends is out of the question.

Foreign Affairs

The chief reaction to the Mexican Light & Power reconstruction scheme—which had a generally good reception—has been the rise in the quotation for the 5 per cent first mortgage bonds from 110 to 125. Prospects for the junior issues are apparently too much of a long-term character to attract much interest. Among other foreign securities—which, incidentally, are showing as a class an unaccustomed amount of activity just now—Tokyo Electric 6 per cent bonds have joined with other Japanese issues in a further emphatic advance. The price is now 60, as compared with 44 a year ago, and 56 last month. Madras Electric's chairman told shareholders that the local Government had not agreed the valuation figure placed on the undertaking for purposes of the take-over and arbitration proceedings might be necessary. The shares are now 33s, as compared with 36s 3d at the end of last year.

Delayed Action Switch

For Aircraft Engine Fire Extinguishers

A TIME delay switch, which is being made by Venner Time Switches, Ltd., Kingston-By-Pass, New Malden, Surrey, is for use in aircraft engine fire extinguisher systems to delay the discharge of the main methyl-bromide spray over the engine for a sufficient time after initiation by the pilot for the purpose of allowing the engine to come to rest.

The device operates through the feathering button, which is arranged to feed the main coil of the relay. This opens the main bottle contacts and closes a circuit on to a holding-in coil for 8 seconds, and also starts the relay running.

After 8 seconds the holding-in contacts break and a pair of contacts in series with the main bottle contacts close and, if feathering is completed, the main contacts will close and the bottles operate.

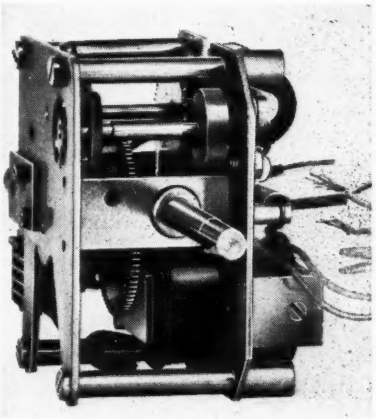
After 20 seconds, however, if feathering has not been completed, a further pair of contacts in series with the main coil, open under influence of the delay action, releasing the armature and allowing the main bottle contacts to close. Thus, between 8 and 20 seconds flooding is automatically governed by completion of the feathering, while after that period, it is accomplished by the delay action switch in order to prevent spreading of fire.

Loading the Mechanism

Flooding cannot take place before the minimum period of 8 seconds, and the relay requires only a short impulse to start. Once started it maintains its action, obviating the necessity for the pilot to keep the feathering button pressed in.

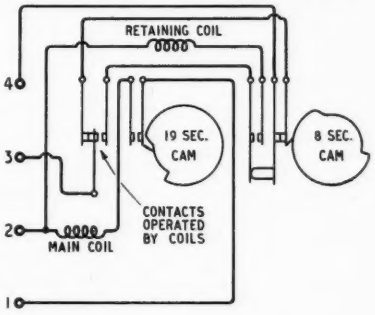
The switch has been produced to a specification of the M.O.S. Directorate of Instrument Research and Development and has a clockwork mechanism provided with a solenoid operated release. It is loaded by depressing a button protruding from the side of the switch after which the button returns to its outward position, the amount of free travel on further depression indicating that the mechanism has been loaded. The solenoid has been designed to pass a current not exceeding 2.5 A at 28.5 V d.c. and to have a minimum operating voltage of 16 V at 20 deg C.

The delay mechanism operates satisfactorily within the limits specified at any altitude from sea level up to 50,000 feet, or in any air pressure between atmospheric and



Mechanism of the Venner time delay switch

Positions of cams and contacts in the switch at end of run, the coils being de-energized



1.65 lb/sq in over a temperature range of −40 deg to +80 deg and under the conditions of vibration normally encountered in an aircraft fuselage.

The complete unit is housed in a robust metal casing, suitably proofed to withstand extremes of temperature and widely differing climatic conditions. Weighing only 1.25 lb, it measures 4.37 in long by 3.32 in wide by 2.25 in deep.

FISH SMOKING

Advantages of Electrical Air Circulation

UNTIL recently the methods available for the smoking of herrings, haddock and other fish could only be described as primitive. An attempt is now being made by the Herring Industry Board to bring the industry up to date and the assistance of the Department of Scientific and Industrial Research has been sought in the preparation of the designs of suitable plants. Several installations to the general pattern suggested have been carried out by the Airscrew Co., Ltd., Weybridge, and are now working successfully.

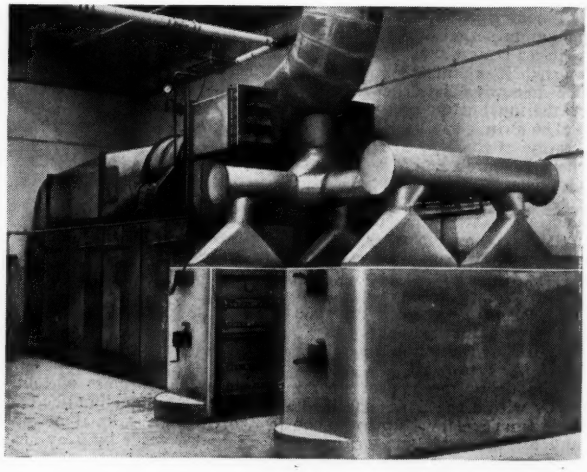
In these installations the wooden tenters, on which the fish are placed after splitting, dyeing and brining, are loaded on to trucks 6ft long, 6ft 9in high and 3ft 9in wide, having a capacity of two crans (150 stone) of kipper output. Usually four of these trucks can be accommodated in the batch-type kiln employed.

The generation of the necessary smoke is achieved by the combustion of wood chips and sawdust on a hearth with draught regulation and stoking facilities so arranged that opening of the kiln is unnecessary. The smoke-laden air warmed by hot water or steam coils is sucked from the hearths by a 42in laminated wood-bladed fan, vee-belt driven by a 10 h.p. 950 r.p.m., totally enclosed motor. The fan, which has a tip speed of 10,500 ft/min, incorporates a special type of streamlined fairing, while guide vanes ensure that the air enters all parts of the kiln at a uniform velocity and direction. Temperature is controlled automatically by an electro-magnetic valve and hand-operated levers afford control of humidity, smoke density and ventilation rate. By these means it is possible to ensure a uniform loss of moisture content to within $\pm 1\frac{1}{2}$ per cent. Opening of the kiln doors automatically switches off the motor.

Compared with smoking times ranging from 8 to 16 hours by the old vertical type, the new kilns take only $2\frac{1}{4}$-$3\frac{1}{2}$ hours when dealing with herrings. Dyed haddocks take 4 hours, fillets 4 to 6 hours and salmon 10 to 12 hours. Although the new kilns take up more room than the old type they have at least double the capacity and are started up quickly.

For use under summer conditions a forced air cooler, incorporating a 27in fan driven by a $2\frac{1}{2}$ h.p. motor, has been found a useful addition to the smoking kiln. It cools the fish ready for packing in approximately twenty minutes.

The possibility of using electricity for heating the kilns is under consideration.



One of the latest types of kiln showing the smoke generators, air heaters and fan

ELECTRICITY SUPPLY

Farmers Support Welsh Scheme
Fire Sales in Eastern Area

A RESOLUTION calling on the British Electricity Authority to proceed with all possible speed with the hydro-electrification project for North Wales, was adopted by a large majority at the conference of Young Farmers' Clubs at Llandudno last week. One member said hydro-electric engineers had plans to open up new areas of the mountains, making it easier for farmers to carry out improvements.

Plant Extensions

Meaford power station, near Stoke-on-Trent, is to be extended at a cost of £6,000,000. The present capacity of the station is 120,000 kW, and by 1953 that figure is expected to be doubled. Further extensions planned will increase the capacity to 360,000 kW.

The first of six 60,000 kW generating sets to be installed at the new Staythorpe power station, Notts, was started up for a test run on 31st December. It is anticipated that it will be on test for three weeks before being handed over to the British Electricity Authority.

One of two 50,000 kW turbo-alternators scheduled under the fourth section of the North Wilford power station, Nottingham, has recently been brought into commission, raising the capacity of the station to 200,000 kW. The present plant extensions comprise, in addition to the two sets, four 320,000 lb/hr pulverized-fuel fired boilers.

Wash Boilers

Having received consent to loans for installing electric wash boilers in certain Council houses, Williton (Som.) R.D.C. has decided to seek sanction for a loan to equip all its post-war houses in the same way. An addition of 3d a week will be made to the rent of the houses.

Malvern Maintains Opposition

Besides maintaining its opposition to the proposed overhead line across the Malvern Hills the Malvern Urban District Council last week refused to agree to a dummy pylon suggested by the Midlands Electricity Board. Councillor F. A. Edwards stated that they were averse to having overhead lines of any description over the hills and would offer the same opposition to a temporary one as to a permanent one. They had definitely made up their minds that these pylons would be detrimental to the whole district.

Fire Sales Restricted

Because of their adverse effect upon electricity supply electric fires are not to be sold, for the time being, at the service centres of the Eastern Electricity Board, unless they are "essential for reasons of health or safety, or where the replacement of an old fire is required." The Board announces that "wall type fires for bedroom use are also available." An appeal is made for the co-operation of contractors and stores in the Area in this endeavour to ensure the maintenance of the supply. At the same time consumers are asked to use their fires as little as possible during peak-load hours.

Situation in France

It has recently been announced by the French Ministry of Industrial Production that daily electricity consumption has reached 100 million kWh. Production has risen following improved conditions at hydraulic plants and also accelerated construction of thermal plants. France is at present exporting 500,000 kWh daily to Switzerland and Italy; it is considered preferable to export power rather than increase allowances to industry which might have to be stopped before the industries are properly organized to use the additional supplies.

Despite increased costs the Administrative Council of Electricité de France has announced that no increase in tariffs is envisaged in 1950. Expenditure is not expected to exceed that of 1949.

Lighting Schemes

Huddersfield Town Council has been recommended to spend £45,000 on replacing most of the gas street lamps by electric lighting. The scheme includes the provision of sodium lighting on certain by-pass roads. Mr. R. Wood, chairman of the Highways Committee, said that it was proposed to spend £15,000 annually for the next three years. The gas pipes for street lighting

were old and a considerable sum was being expended on maintenance. The new scheme would lead to a considerable saving in maintenance costs as well as providing better street lighting.

Stockport General Purposes Committee has decided to convert the remaining 4,000 street gas lamps to electricity at a cost of £84,000. Existing standards will be used for the suspension of 80 W mercury vapour lamps.

Public lighting at Bakewell is to be changed from gas to electricity. The Urban District Council has agreed to proceed at once with the conversion of twelve existing gas lamps to electricity in prominent positions in the town.

The replacement of the gas street lamps by electric lamps is being considered by the St. Ives Town Council.

Electricity is to replace gas for street lighting at Enderby, Leics.

What are believed to be the first fluorescent street lamps in Derbyshire were recently switched on in Hegle Street, Alfreton.

Eastern Area Activities

Economy Cuts Deplored

A RESOLUTION expressing the view that electrical power was so essentially the life-blood of the modern industrial nation that any curtailment of generation or distribution was false economy which must delay the recovery of the British people was passed by the Eastern Electricity Consultative Council which met in London last Friday. The resolution, proposed by Mr. A. W. Sanders, is being sent to the Minister of Fuel and Power.

The question of joint meter readings was raised in a letter from Dr. Stephen Taylor, M.P., forwarded by the Eastern Gas Consultative Council. The suggestion was submitted to the Eastern Electricity Board which replied that joint meter readings were tried experimentally during the war and since they did not result in any saving of man-power the scheme was ultimately dropped. Most of the local authorities which had considered the question came to the conclusion that, in practice, such a system would reduce efficiency and make it impossible to give consumers so good a standard of service. The Board therefore felt that the best interests of consumers would not be served by any further experiments of the kind at the present time.

It was reported that the General Purposes Committee had had under consideration the question of domestic tariffs and recommended that the two-part basis should be adopted. A further meeting would be held later in the month to discuss all the implications.

Regarding the Eastern Board's announcement of restrictions on the sale of fires at its service centres, it was felt that the Council should have been consulted. The view was also expressed that any action of the sort should preferably be taken at national level. The chairman (Alderman W. J. Bennett) said that personally he felt the peak problem was definitely an engineering one. There was a tendency in these days to try to make the consumer fit into some kind of technical framework. It was remarkable that after all these years there was nothing better than a hot wire to warm a room.

Lighting the House of Commons

WHEN daylight fades in the new House of Commons artificial lighting will be introduced gradually to avoid distracting members. The ceiling of the new Chamber has been designed in the form of 150 panels with carved oak framing for the ceiling lights: in daylight it is seen as an architectural feature of great beauty with no suggestion of being the framework of a lighting system. Behind each of the ceiling panels of the Chamber is a spiral cold cathode "Osram" fluorescent lamp, the complete installation being operated by a new type of control gear which enables the general lighting to be increased or reduced to any level between zero and full brightness at the direction of the Speaker. It is estimated that the cold cathode units will not need replacing for ten years. The under-gallery and window sill lighting in the Chamber is from "Osram" hot cathode fluorescent lamps controlled in a similar manner.

The scheme, which is believed to be the first of its kind, has been produced by the illuminating engineers and the Research Department of the General Electric Co., Ltd., in collaboration with the architect, Sir Giles Gilbert Scott, O.M., R.A., and the consulting engineers, Dr. Oscar Faber and Partners. The effect of the whole scheme when at its full brilliance will be to bathe the Chamber in a mellow sunny light.

The G.E.C. will also be responsible for the decorative fittings to be installed in the Ministers' rooms, committee rooms, lobbies and corridors. To hasten completion within the time required, part of this work will be undertaken in co-operation with Osler & Faraday, Ltd., and Smith & Ansell, Ltd., which is a totally owned subsidiary of Falk, Stadelmann & Co., Ltd.

The whole of the electrical installation will be carried out by Troughton & Young, Ltd.

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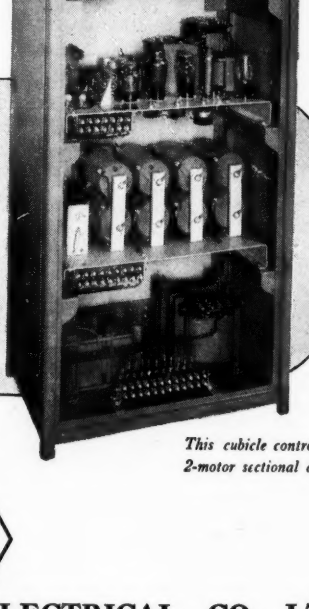

This cubicle controls a 2-motor sectional drive

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H/A 903

Automatic Control Unit

FOR the automatic control of moulding presses in the plastics industry Mr. R. Collier of Arcolectric (Switches), Ltd., Central Avenue, West Molesey, Surrey, has devised and patented a simple unit which at the touch of a single button will control all the operations of a moulding press and at the same time take into consideration any variation which may occur in the volumetric efficiency of the hydraulic supply.

Two prototype control units have been made by the company and during a recent visit to the factory we saw them in action, one being associated with a 60 ton and the other a 25 ton press. Both machines were of the upstroke type with pushback cylinder and were fitted with screw-down valves. One girl worked both these and two non-automatic presses. Production proceeded simply and smoothly, the only non-automatic operation being the loading, the pressure of the button and the stripping of the mould.

The controller comprises a motor driven member carrying a series of cams which are arranged to actuate pressure and exhaust valves in a predetermined sequence. A second series of cams operates switches to open and close the motor circuit, while the whole is associated with a conventional process timer. The motor-driven control member is a disc, the two series of cams being adjustably fitted on each side so that the duration of any step in the cycle can be pre-set.

Future development of the control mechanism to increase its range of application to other types of presses will be undertaken jointly by Mr. R. Collier and Bradley & Turton, Ltd., of Kidderminster. The units will be made by Arcolectric (Switches), Ltd., in conjunction with Bradley & Turton, Ltd., the latter company also being responsible for the complete assembly with the hydraulic press and for sales distribution and service.

Automatic control unit used in conjunction with an upstroke plastics moulding press

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Report on the Netherlands

THE electrical industry and trade of the Netherlands are reviewed by Mr. L. B. S. Larkins, O.B.E., Counsellor (Commercial), H.M. Embassy, The Hague, in the course of a report on the economic and commercial conditions in the Netherlands, published for the Board of Trade by H.M. Stationary Office at 2s net.

Dealing with the country's foreign trade Mr. Larkin says that in 1948 the United Kingdom secured the lead over her chief competitors, the United States, Belgium, Sweden and Switzerland in Dutch imports of machinery, industrial plant and electro-technical material, with a total value of fl. 120 millions. Provided the supply position remained satisfactory the prospects for 1949 (the report is dated July 1st, 1949) should be favourable for United Kingdom imports in this category of goods. Contracts for the supply of fifty electric locomotives to the State Railways were placed in France, principally owing to the early delivery offered. Another fifty will be required to complete the scheme. The extension of the State Railways scheme of electrification will require the construction of twelve rectifier stations of 2,400 kW each; the orders have been placed with United Kingdom firms against strong Swiss competition. The Swiss are competing strongly for tramway motors and control gear required for the Rotterdam and Haarlem tramways, while United Kingdom firms are making efforts to secure orders for electrical equipment for the Amsterdam-Zandvoort tramway.

The Philips concern is one of Europe's

largest radio manufacturers, and, with a handful of smaller firms, supplies not only a large percentage of home needs, but also exports on a large scale. United Kingdom manufacturers of telegraphic and telephonic equipment at present enjoy a fair share of the Dutch market. Competition is, however, very strong, especially from Belgium and Switzerland. The Dutch postal authorities have recently purchased £10,000 worth of radio-telephone equipment in the United Kingdom, and since the war thirteen automatic telephone exchanges have been supplied by British manufacturers.

Early in 1948 Philips Lamp Works company concluded an agreement with the Western Electric Co. whereby the parties have granted each other exclusive rights to use their mutual patented inventions in the field of telecommunication, including radio. Further, an agreement was concluded which ensures to Philips the right to use all present and future patents for automatic telephony held by the American company. A United Kingdom company has established itself with the Netherlands postal and telephone authorities for the automatic public-exchange business in the market previously held by the German Siemens & Halske works. As early as April, 1947, production at the Philips Works had reached 113 per cent of the pre-war output. The company is working to capacity and the total personnel now numbers nearly 35,000. During 1947 Dutch vacuum-cleaner manufacturers together produced 150,000 machines, but in 1948 they were permitted to turn out only 36,000, as exports are hampered by exchange regulations. This has been the first instance of over-production reported by Netherlands manufacturers. With the technical assistance of a Swiss firm, production of portable electric sewing machines has now started, of which it is expected to turn out 20,000-25,000 in the first year. The motors will be imported from Switzerland.

Ceylon's Electrical Imports

ACCORDING to the recently issued detailed statistics of Ceylon's external trade in 1948, electrical imports continued the recovery which took place between 1946 and 1947. The only noteworthy exceptions to the advance in 1948 were radio goods and batteries. The values of the chief lines of import are given below, with notes of increases or decreases compared with 1947. It will be seen that the share of the United Kingdom was well maintained. A summary of the trend in the first six months of 1949 shows an increase of about 30 per cent in electrical imports. (Rupee=1s 6d.)

Among various changes introduced in the last Ceylon budget the classification of electric refrigerators as domestic is limited to machines of 10 cu ft capacity and under, whereas the non-domestic schedule is applicable to all those over 10 cu ft. There is an increase in duty and a decrease in the margin of preference on electric splash-proof accumulators and batteries for motor vehicles.

Class of Goods and Supplying Countries	1948 Rs.(000)	Inc. or dec. on 1947 Rs.(000)
Control and switchgear	406*	+ 144
Radio instruments and apparatus	1,199	− 528
From United Kingdom	1,127	− 114
„ *United States*	46	− 226
„ *Holland*	16	− 75
Other telegraph and telephone instruments	707*	+ 388
Lighting accessories, fittings and switches	2,733	+ 1,330
From United Kingdom	1,597	+ 1,121
„ *United States*	31	+ 31
„ *Hong Kong*	1,051	+ 212
Batteries, dry, radio	20†	—
From United Kingdom	11	—
„ *United States*	2	—
Batteries, dry, other	2,240	− 130
From United Kingdom	626	+ 137
„ *United States*	343	− 3
Other batteries and accumulators	13*	− 393
Electrical goods and apparatus not elsewhere specified	1,251	+ 325
From United Kingdom	1,191	+ 350
„ *United States*	53	− 8
Transformers and convertors	201*	+ 122
Generators and alternators and exciters	1,527	+ 1,279
From United Kingdom	248	+ 37
„ *United States*	1,279	+ 1,200
Motors	198	+ 27
From United Kingdom	184	+ 28
Electrical machinery not elsewhere specified	556	+ 46
From United Kingdom	436	+ 22
„ *United States*	29	+ 15
Rubber insulated wires and cables	902	+ 39
From United Kingdom	900	+ 86
Other electric wires and cables	1,236*	+ 658
Lamp bulbs, gas filled	438	+ 141
From United Kingdom	427	+ 138
„ *Holland*	10	+ 10
Other lamp bulbs	163	+ 13
From United Kingdom	150	+ 24
„ *Holland*	1	− 7
Torch bulbs	203	− 30
From United Kingdom	37	+ 13
„ *Canada*	—	− 26
„ *Hong Kong*	117	− 45

* Mainly from U.K. † Comparable figures not available.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Belfast.—3rd February. Electricity Department. Supply of stores. (See this issue.)

Bootle.—21st January. Borough Council. Supply of electric cables and flexes, and electric lamps, for six or twelve months from 1st April next. Borough engineer, Town Hall.

Consett.—4th February. U.D.C. Electrical installations in fifty-one Council houses. (See this issue.)

Coventry.—21st February. Electrical installation in Block "B," Broadgate. (See this issue.)

Enfield.—2nd February. Group Hospital Management Committee. Supply of electric lamps for one year from 1st April next. Supplies Officer, Chase Farm Hospital.

India.—DELHI.—28th February. Central Electricity Commission. Two 3,000 kW turbo-generators, water tube boilers, switchgear and accessories, and transformers for Jodhpur power station. (C.R.E. (I.B.) 37481/49. Ten/866.)*

Lanark.—County Council. Street lighting fittings and columns. (See 6th January issue.)

Manchester.—23rd January. Welfare Services Committee. Electrical works required in connection with conversion of "C" and "D" Homes, Nell Lane, West Didsbury, for aged persons' home. City architect, Town Hall.

New Zealand.—WELLINGTON.—24th January. Postal Telegraph Department. 750 miles of tinned or untinned copper wire. (C.R.E. (I.B.) 28568/49. Ten/881.)* 31st January. 20 miles of triple flame-proof wire. (C.R.E. (I.B.) 38591/49. Ten/883.)* Supply of 20,000 yd of power cable. (C.R.E. (I.B.) 38567/49. Ten/884.)* 17th February. Paper-insulated telephone cable. (C.R.E. (I.B.) 38590/49. Ten/882.)* Distributor and spark plug suppressors (C.R.E. (I.B.) 38565/49. Ten/880.)*

Peterborough.—City Council. Electrical installations in seventy-six houses. (See this issue.)

Southern Rhodesia.—SALISBURY.—28th February. City Council. Electric motors and autostarters for Hunyani Poort pumping station. (C.R.E. (I.B.) 37695/49. Ten/867.)*

Swansea.—4th February. Borough Council. Supply of electric lamps for public lighting for one year from 1st April next. Borough engineer, Guildhall.

Tottenham.—3rd February. Borough Council. Supply of electric lamps for one year. M. Lindsay Taylor, town clerk, Town Hall, N.15.

Uruguay.—MONTEVIDEO.—29th May. Usinas Electricas y Telefonos del Estado. D.c. and a.c. measuring instruments. (C.R.E. (I.B.) 37582/49. Ten/863.)*

Warwick.—County Council. Firms wishing to have their names included in a list of approved contractors for heating, hot and cold water supplies, steam services, laundry and kitchen equipment, and electric light and power installations should apply to the county architect by 31st January. (See 6th January issue.)

Yeovil.—25th January. Corporation. Street lighting scheme. (See 6th January issue.)

ORDERS PLACED

Birkenhead.—Corporation Education Committee. Recommended. Electrical installation work at "Beechcroft" (£707). Merseyside and North Wales Electricity Board.

Carlisle.—City Council. Electrical installations in 76 houses. G. Graham.

Coventry. — Housing Committee. Recommended. Electrical installations in 128 houses (£5,087). Three Spires Electric Co. (This was not the lowest tender received.)

Corporation. Electrical installation at Primary School, Courthouse Green (£3,234). Lee, Beesley & Co.

Dagenham.—Borough Council. Electrical installations in dwellings on Heath Park estate (£10,705). Evans & Shea. Lifts (£8,114). J. & E. Hall.

Jarrow-on-Tyne.—Town Council. Electrical fittings for No. 10 housing scheme. McCabe's Electrical Services.

Newcastle-under-Lyme.—Corporation. Electrical installations in houses at Bradwell, Clayton and Chesterton (£5,696). Midlands Electricity Board.

Northampton.—Corporation. Electrical wiring of 10 old people's homes at Kings Heath (£135). E. J. Perrin.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Extension to secondary school, Ardwyn, for C.C. (£30,977); F. E. Davies & Son, Aberath.

Ashby.—Secondary school (£185,000); county architect, Grey Friars, Leicester.

Ashton-in-Makerfield.—Houses (50), Bryn Station site; borough surveyor.

Bedlington.—Crematorium (£40,000); W. Hall, U.D.C. surveyor.

Blackrod.—Houses (38), Half Acre Lane site, for U.D.C.; surveyor, Council Offices.

* Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1. Victoria 9040.

Billingham-on-Tees.—Houses (160) for the U.D.C.; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Rebuilding of 25 war-damaged houses for the Furness Shipbuilding Co., Ltd., Haverton Hill.

Birmingham.—Houses (22) for Ministry of Works; Eadie & Co., Ltd., builders, 29, Waterloo Road, Wolverhampton.

Blyth (Northumberland).—Communal wash houses (£7,000); D. W. Foster, borough engineer.

Boldon.—Houses (44), Boldon Colliery, for U.D.C.; Gordon Durham and Co., builders, East Boldon.

Bournemouth.—Secondary school, West Howe; John Burton, borough architect.

Bradford.—Receiving home, Squire Lane (£29,231); W. H. Leathem, town clerk, Town Hall.

Houses (150), Airey type; city architect.

Bridgnorth.—Conversions at Innage House for nurses' home; A. G. Chant, county architect, Column House, London Road, Shrewsbury.

Brighton.—Cleansing station (£12,000), Hollingdean; borough surveyor.

Secondary school, Stanmer; Kirk & Kirk, Ltd., builders, Atlas Works, Putney, S.W.15.

Bristol.—Two-storey factory, Bedminster Trading Estate; John Beaufort, Ltd., Bridgwater.

Dwellings for 530 key workers at Redcliffe; city architect.

Crawley.—Factory for W. C. Youngman, Ltd., Wandsworth Road, S.W.8; James Longley & Co., Ltd., builders, Crawley.

Crosby.—Flats (112); Gittins Bros., 32, Orchard Dale, Great Crosby.

Devonport.—Factory extension for Navy, Army & Air Force Institutes; Dudley Coles, Ltd., builders, Brooklands Lodge, Hartley Road, Plymouth.

Glasgow.—Works, Finnieston Street; Carron Company, Carron, Falkirk.

Gosforth.—Thirty-two flats, Regent Farm estate, for the U.D.C.; M. J. Liddell and Son, builders, Hunters Road.

Greenock.—Ice cream factory, Newton Street; F. Petrie, architect, Library Buildings, Wallace Square.

Ilford.—Factory extensions; C. J. Whilems, Ltd., Forest Road.

Kidderminster.—Second instalment of Lea Castle Colony (£154,000) for Birmingham Regional Hospital Board; D. A. Goldfinch, 10, Augustus Road, Birmingham.

Kingston-on-Thames.—Reinstatement of Ashcombe block at County Hall; county architect, County Hall.

Lancashire.—Extensions at Crosby junior & infants' county school; P. J. Westwood & Son, architects, 3, Raymond Buildings, Grays Inn, London, W.C.1.

Leicester.—Blocks of flats, New Parks estate (£544,710); city architect.

Lincoln.—Primary school, Boultham; chief education officer, 4, Lindum Road.

Llandudno.—Nurses' home extension and conversion of isolation block to medical wards at General Hospital; Charles B. Pearson & Son, architects, 18, Dalton Square, Lancaster.

London.—CLAPHAM.—Block of flats, Loughborough Road; Guinness Trust, 5, Victoria Street, S.W.1.

WANDSWORTH.—Flats (103), Rinaldo Street; borough architect.

WESTMINSTER.—Flats (64), section II of Tachbrook estate; Westminster Housing Trust, Ltd., 41, Whitehall, S.W.1.

EAST DULWICH.—Dwellings (50), Melford Road, for Camberwell B.C.; John Grey & Partner, architects, 43, Oakley Street, S.W.3.

POPLAR.—Flats (53), maisonettes (72) and houses (41), Grundy Street, for L.C.C.; G. A. Jellicoe, architect, 12, Gower Street, W.C.1.

Middlesbrough.—Thorntree No. 1 primary school (£84,000); Turner and Ing, quantity surveyors, 2, Garden Street, Darlington.

Newcastle-on-Tyne.—New R.C. school at Cowgate (£50,000); director of education.

New Hilton Primary School (£117,000); Cussins, Ltd., builders, Moor Court, Gosforth, Northumberland.

Houses in flats, Silver Lonnen; E. Jeffcock, Ltd., builders, New Bridge Street, Newcastle-on-Tyne.

Rebuilding part of confectionery works, Pitt Street and Barrack Road; J. R. Wetherell, architect, Picton Place.

Two foundries and cooling shops for British Engines, Ltd., Glasshouse Street; R. Bowey & Son, Back Raby Street, Newcastle.

Northampton.—Houses, King's Heath estate; Corporation Public Works Deparment, and T. Wilson & Son, Ltd., Sheep Street, Northampton (41 houses each).

Oswestry.—Reconstruction of fire-damaged wards (£30,000) at Robert Jones and Agnes Hunt Orthopædic Hospital, for Birmingham Regional Hospital Board; Ford & Weston, Ltd., builders, Osmaston Road, Derby.

Shipley.—Works extensions; E. Illingworth & Co., Ltd., Hillside Works, Leeds Road.

South Shields.—Additions to factory in Station Road for Burndept, Ltd.; R. Collins, architect, Russell Buildings, King Street.

Stockton-on-Tees.—Open air theatre at the Ropner Park (£16,000); borough engineer.

Houses (51), Grange Avenue, etc., for Marsh (Builders), Ltd., Stockton.

Structural engineering and contractors' works in Boathouse Lane for Gastron, Ltd.

Sunderland.—Additions to Bede Towers Hostel (£70,000); Snowdon Brothers, builders, Belford Road.

Wentworth Woodhouse.—Development of Lady Mabel College of Physical Education (£183,346), for West Riding E.C.; county architect, County Hall, Wakefield.

West Bromwich.—Flats and maisonettes, Hateley Heath estate; J. D. Eadie & Co. (Wolverhampton), Ltd., 29, Waterloo Road, Wolverhampton.

West Hartlepool.—Houses (230) for the T.C.; S. M. Richmond, borough architect.

Wigton.—Houses (115); R.D.C. surveyor.

Worksop.—Factory for Bairns-Wear, Ltd., Perry Road, Basford; W. J. Simms, Sons & Cooke, Ltd., builders, Hadyn Road, Sherwood, Nottingham.

Worsborough.—Houses (40), Elm House estate for U.D.C.; Taylor, Knight & Co., architects, All Saints Square, College Street, Keighley.